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Quercus Wislizeni in Southern California.

BY LEROY ABRAMS.

In a former article in this publication (I:89, 1902) I had occasion to mention the occurrence of **Quercus Wislizeni** A. DC. in Southern California. Since then Mr. Parish in a later number of this publication (II:11, 1903) doubts the determination of my specimens, at least as far as the plants from San Bernardino Mountains are concerned. He says: "I have been unable to detect it in the San Bernardino Mountains, and specimens from that station with which Mr. Abrams has obliged me, while indecisive, appear rather to belong to **Q. dumosa**, the common scrub oak of the region." That this species should be confused with **Q. dumosa** can hardly be understood for they have nothing in common save that both, in our region, are shrubby. This confusion seems to exist, however, and for that reason it may be proper to point out some of the differences. The leaves of **Q. dumosa**, as it is now understood, are variable, but they are usually blunt and more or less short pubescent and grayish beneath, while those of **Q. Wislizeni** are usually pointed, a bright, glossy green and smooth on both surfaces. These characters make them easily distinguished in the sterile condition. In the fruit the characters are still more pronounced. **Q. dumosa**, being a white oak, has usually blunt acorns and more or less tuberculate cups, caused by the thickened scales. **Q. Wislizeni**, on the other hand, is a black oak and has pointed acorns and deep cups composed of thin scales, much resembling those of the well-known **Q. agrifolia**, to which species it is much more nearly related. This can be distinguished from both **Q. dumosa** and **Q. agrifolia,** however, in that it develops the fruit the second year while they mature theirs the first. Some do not seem able to detect this fact unless they find the fruit and undeveloped ovules on the same twig, a circumstance seldom met with, for only the most vigorous twigs develop fruit two years in succession, but when it is known that the flowers appear on the young shoots in the spring, it goes without saying that, when the fruit develops the first year, it will be found on the twigs of the same season's growth, while those that develop the second year will be found on last year's twigs. Knowing this, it can, in nearly every case, be easily learned which year the fruit develops.

Upon the re-examination of my material I became convinced that my determinations alluded to above were correct and that these plants agree well with those from the more northern part of the state, and in addition to my former material, I have had the advantage of another season's collecting and am enabled to extend the range still further. Besides this material I have had the privilege of examining that in the following herbaria: Brandegee, Parish, California Academy of Sciences and Stanford University, in all of which I found more or less from our range. I give below a list of the specimens I examined, which were collected below the Tehachapi, including the collector and the herbarium in which the specimens are to be found:

Cuddy's Ranch, near Gormans Station. **Dudley,** No. 4366. (S. U.)

Kings Canyon, Sierra Liebre Mts. **Dudley,** No. 4346. (S. U.)

Mt. Lowe, **Dudley,** July 20, 1899. (S. U.)

Mt. Wilson. **Abrams,** No. 1518. (Abrams, S. U.)

Lytle Creek Canyon. **Hall,** No. 901. (S. U.)

Santa Inez Mountains. **Franceschi,** 1894. (Brandegee.)

Mt. Lowe. **Kinney,** September, 1902. (Parish.)

Arrowhead Grade, San Bernardino Mountains. **Shaw,** August, 1900. (Parish, Abrams.)

Santa Ana Canyon, San Bernardino Mountains. **Shaw,** August, 1900. (Abrams.)

Spencer Valley, San Diego County. **Abrams,** No. 3875. (Abrams, S. U.)

Cuyamaca Mountain. **Abrams,** No. 3950. (Abrams, S. U.)

Walker's Ranch, near Jacumba. **Abrams** No. 3697. (Abrams, S. U.)

San Pedro Martir, Lower California. **Brandegee.** (Cal. Academy.)

Stanford University.

The Bees of Southern California.—I.

BY T. D. A. COCKERELL.

The series of articles to appear under the above title will contain descriptions and records of Southern California bees, and it is hoped eventually to publish tables for the identification of all the species.

Stelis laticincta, Cresson.

Wilson's Peak, one male, collected by Dr. Davidson.

Only the female has been described. The male is similar, but only 6 mm. long, with the clypeus, a small supraclypeal mark, and a line beneath anterior ocellus, all yellow, in addition to the markings present in the female. The yellow stripes behind the eyes are continuous right across the top of the head. The anterior and hind tibiae are yellow on the outer side.

While working up the present insect I have become satisfied that the New Mexico insect which has passed for years as **S. costalis,** is quite distinct. It is to be said that Mr. Fox long ago compared it with Cresson's types, and did not think it was **costalis.** It may be known as **S. rudbeckiarum,** n. sp., the type being my No. 1567, Santa Fe, July, at flowers of **Rudbeckia.** It is about 7 mm. long, varying to 5½, and the male agrees with Cresson's description of female **costalis,** except in the following character: Tubercles and pleura wholly black tegulae ferruginous, with a yellowish spot anteriorly; legs black, the knees broadly and the tarsi red, the hind femora have a good deal of red, and the tibiae show a little reddish on the inner side; yellow band on third abdominal segment not indented. The clypeus is entirely black.

Dianthidium.

Four species of this genus have been collected in Southern California. In the following table they are separated and compared with several species found elsewhere.

Scutellum all black in both sexes; size large (Europe).. ....**septemdentatum** (Latr.)

Scutellum with at least some yellow or whitish; size smaller 1

1. Small, compact species, with the hind edge of the scutellum produced and sharp-edged, the yellow marks on scutellum in a straight line or almost so; posterior coxae without spines. (**Anthidiellum,** n. subg., type **strigatum)** 2

Not so; scutellum less produced, the yellow marks or band on scutellum not in a straight line.............. 5.

2. Band on second abdominal segment nearly as widely interrupted as that on first, i. e., reduced to lateral marks (Europe)....................**strigatum** (Panzer).
Band on first adbdominal segment reduced to lateral marks, but that on second at most very narrowly interrupted... 3.
3. Hind tibia without black (New Mexico)....**gilense** (Ckll.)
Hind tibia with a good deal of black................... 4.
4. End of male abdomen with four little teeth; band on second abdominal segment very broadly interrupted (Mojave Desert ....**ehrhorni** (Ckll.)
End of male abdomen without such teeth; band on second abdominal segment very narrowly interrupted (Southern California)...............**robertsoni** (Ckll.)
5. Yellow band on first abdominal segment broadly interrupted in the middle (New Mexico)....**perpictum** (Ckll.)
Band on first abdominal segment entire in the middle, interrupted, if at all, at the sides................... 6.
6. Base of abdomen with a good deal of red (Georgia, Texas, New Mexico, etc...............**curvatum** (Smith.)
Base of abdomen without red....................... 7.
7. End of male abdomen strongly trilobed; male with no supraclypeal mark; markings of abdomen chrome yellow in both sexes (So. California)......**consimile** (Ashm.)
End of male abdomen truncate, faintly trilobed; male with a small supraclypeal mark.................. 8.
8. Markings of abdomen pale yellow, bands more incised laterally (New Mexico, Colorado).......**parvum** (Cress.)
Markings of abdomen bright yellow, bands less incised laterally (Southern California)........**davidsoni** (Ckll.)

Dianthidium robertsoni, n. sp.

Four specimens collected by Dr. Davidson, three from Rock Creek, one from Los Angeles. Named after Mr. Charles Robertson, who first pointed out the presence of pulvilli in the genus. Small and compact, 5½ to 7 mm. long, the larger being females; black, with chrome yellow markings, strongly punctured; apex and apical half of costa of wings broadly fuliginous, the whole of the marginal and nearly all of the submarginal cells dark; the only yellow marks on head in the female are the large cuneiform lateral face-marks, and the entire occipital band, but in the male the clypeus and two triangles occupying the corners of the supraclypeal area and touching or almost touching medially are light yellow; markings of thorax and abdomen as in **D. gilense**, except that the anterolateral stripes on margin of mesothorax are not bent posteriorly, the anterolateral spots on scutellum are wanting, the abdominal bands on the third and following segments are somewhat more widely interrupted, and are laterally very deeply incised or divided altogether, those on four and five always being divided; the sixth segment has much black, being in the female black with two yellow marks, and in the male usually yellow with a reversed black T; ventral scopa white; legs in female black, the apices of femora, tibiae and tarsi ferruginous; anterior tibae with more than the basal half yellow outside, middle tibiae all yellow outside, hind tibiae with a yellow basal spot; in the male the anterior and middle legs are strongly bearded with long white hair, the anterior tibiae are yellow outwardly and pale reddish within, the middle tibiae are yellow with a very large black spot on the outer surface and a similar reddish one on the inner, and the hind tibiae are black with the ends broadly yellow, the tarsi have the basal joint yellow and the small joints ferruginous; the apex of the male abdomen is truncate with a faint trilobation.

Dianthidium consimile (Ashmead.)

Dr. Davidson sends me three collected at Los Angeles; they bear dates June 13 and 15. I have identified the species from Ashmead's description, but I find that this, although stated to be that of a female, accords with the male of the insect before me. In the female the clypeus is black in the middle and yellow only at the sides. Except for this discrepancy the description applies excellently. The yellow tooth or spine on the hind coxae is very small in the female, somewhat larger in the male.

Dianthidium davidsoni, n. sp.

Two males collected by Dr. Davidson at Bear Valley, California.

Length 8 to 9 mm.; black with bright chrome yellow markings. In structure and markings similar to **D. parvum,** but larger, with the yellow much brighter, and the abdominal bands much less incised. The pubescence of the upper part of the head and thorax has a yellowish tint. Apical segment of abdomen yellow, truncate and faintly trilobed, only its extreme base, where it is overlapped by the penultimate segment, is black; penultimate segment yellow except the overlapped base, a median basal pointed process, and two transverse subapical marks (in **parvum** it is black with two light yellow crescents joining medially); first recurrent nervure about as far from base of second submarginal cell as the second is beyond its apex; yellow spines of hind coxae very large; pleura with or without a small yellow spot.

The following species, hitherto placed in **Anthidium,** must be transferred to **Dianthidium, D. formosum** (Cress.), **D. gabbi**

(Cress.), **D. mexicanum** (Cress.), **D. apicale** (Cress.), **D. bivittatum** (Cress.), **D. toltecum** (Cress.), **D. agnatum** (Cress.), **D. texanum** (Cress.), **D. ulkei** (Cress.), **D. cressonii** (Dalla Terre, **D. lepidum** (Cress.), **D. simile,** (Cress.), **D. concinnum** (Cress.), **D. pudens** (Cress). The easiest way to distinguish **Dianthidium** from **Anthidium** is to notice the little pulvillus or pad between the claws, this being absent in the latter genus. **Stelis** looks like **Dianthidium,** but it is a parasitic bee, and consequently the female has no scopa for holding pollen. " " ,

The species of **Dianthidium** are "resiniers," making resin nests; **Anthidium** lines its nest with cottony fibers.

Prehistoric California.

(Continued from December BULLETIN.)

BY DR. LORENZO GORDIN YATES.

WHALE.

Fossil remains of whales have been found at many localities, mostly near the coast. One of these found in the Plicoene ? near Santa Barbara by Professor George Davidson was named by Professor Cope, who called it **Eschrichtius Davidsoni.** It was as large as the "California Gray Whale," but belonged to the "Finbacks."

THE HOG.

Elotherium imperator, Leidy, from the Miocene at Douglas Flat, Calaveras county, under the lava, is described as allied to the hog.

SLOTH.

Professor Cope named an animal found in Quaternary of the Klamath River, at Yreka, the **Moritherium giganteum.** It was an extinct Sloth, and is supposed to have made the tracks resemblinggigantic footprints found in the Carson Quarry in Nevada.

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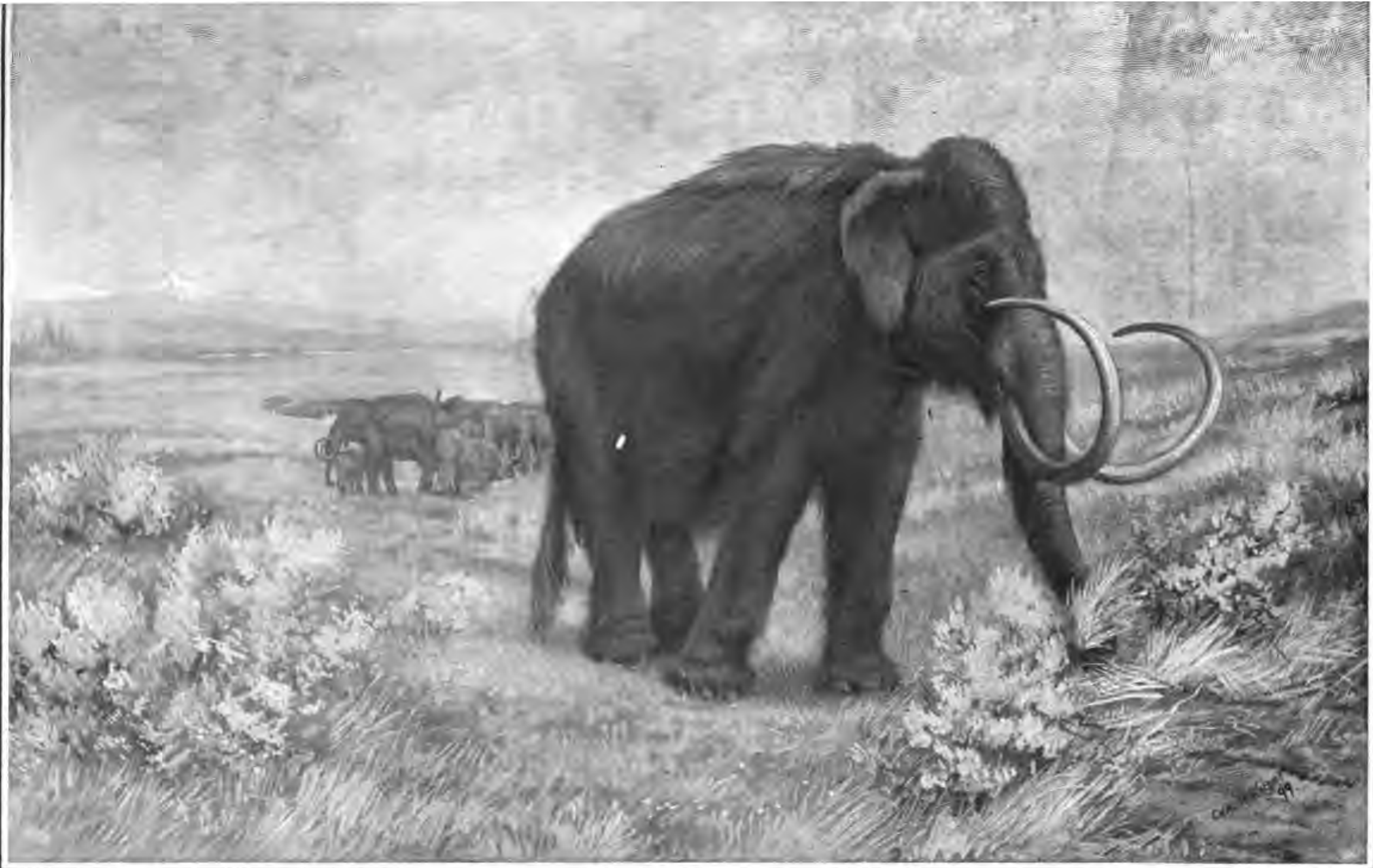
TAPIR.

The South American Tapir is represented by fossils found in the Auriferous Gravel, above the lava, in Tuolumne county.

BEAVER.

A fossil rodent, **Sigmogomphius Le Contei,** Merriam, named for the late Professor Joseph Le Conte, was found by Professor



MAMMOTH (Elephas primigenius)

Copyright, 1899, by S. S. McClure Co.

Reproduction of a painting by C. R. Knight for McClure's Magazine

Courtesy The U. S. National Museum

John C. Merriam of the University of California in the lower deposits of the Pliocene, near Berkeley, in fresh water beds.*

The writer found skulls of the Beaver (Castor fiber ?) in the marshy banks of the San Joaquin River above Antioch. These have not been subjected to critical examination.

NON-MAMMALIAN VERTEBRATES.

Sharks.

Numerous species of fossil sharks have been found in California, notably in Kern county, where ten of the species described by Agassiz have been recognized.

(Numerous specimens of the teeth and bones of vertebrates found in the Quaternary by the writer have not, as yet, been determined.)

In Volume XXIV. of the "Proceedings of the United States National Museum, Washington, 1902," Dr. Frederic A. Lucas has described "A Flightless Auk, **Mancalla Californiensis**, from the Miocene of California."

The genus was founded upon "a nearly complete left humerus found in excavating Third street tunnel at Los Angeles, California, in strata considered by Mr. W. H. Dall as belonging to the Upper Miocene or Lower Pliocene, probably the former."

It is probable, as Professor Whitney and Dr. Cooper suggested, that the fragmentary bones and teeth of many of the extinct mammals which have been found in the Quaternary of California are portions of animals inhabiting California during the Miocene and Pliocene periods, and that during some of the great changes resulting from the erosion and detrition caused by the local elevations and depressions of the surface they were weathered out and transported to distant localities by the rush of waters over their original place of deposit, and were again buried in the debris of later epochs.

All of the fossil remains of the before mentioned animals, which the writer has found in undoubted Quaternary deposits, indicate that the bones had been thus distributed.

Some of those found in the Pliocene may have been originally deposited in Miocene formations. In one instance the writer found in the bed of Alameda Creek, near Niles, Alameda County, a boulder of very hard, coarse conglomerate in which was imbedded a perfect molar tooth of a mastodon. The boulder was undoubtedly a portion of a Pliocene deposit, some miles distant, and had been rounded off by the combined action of water and the friction of other rocks during its rough journey in the rocky bed of the present creek, and had it not been for the material in which it was imbedded being easily recognizable, it would have been referred to the Quaternary. We will go still further back in its history. The tooth was nearly perfect and had been but little worn, showing that it had not been shed during the lifetime of the animal, and not being connected with any other portion of the skeleton, it may have belonged to an animal of the Miocene Period, whose remains were imbedded in the deposits of that period, and had been exposed and subsequently separated from the other portions of the skeletion by the action of the elements and again deposited in one of the "Dead Rivers" of the Pliocene Period, to be again disentombed and removed after the lapse of many thousands of years.

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* Bulletin of the Department of Geology, University of California, Vol. I, No. 13, 1896.

Had this tooth been covered up and left where the writer found it (in close proximity to an Indian Rancheria), it might after other thousands of years, have been discovered by some future scientist and been considered satisfactory proof of the contemporaneity of man and the Mastodon.

Such instances show the necessity of close study, careful discrimination and conservative deductions in an attempt to read detailed history from the Book of Nature.

THE LENGTH OF GEOLOGIC TIME.

For the benefit of those who have not given much thought to the subject of the Earth's age the following estimates made by eminent geologists and physicists are given. Those of the geologists are based upon the present rate of deposit of marine sediment, and the destruction of land by erosion and denudation, compared with the total thickness of sedimentary rocks. The correctness of the estimates—provided that the rates have been always uniform—is evident, but in the absence of that assurance the conclusions are uncertain and elusive.

The estimates of the physicists are based upon the application of the laws of heat radiation, and their conclusions have materially modified the former theory, that for the deposition or formation of the sedimentary rocks a minimum of hundreds of millions of years were required, and for the time which elapsed since the earth was in a molten state no limit could be given.

Mr. Clarence King, a former United States Geologist, as the result of experiments upon the behavior of certain rocks under conditions of heat and pressure, came to the conclusion that it cannot be more than twenty-four million years since the earth was in a molten state or condition.

Mr. Warren Upham gives forty-eight million years as the age of the stratified rocks and one hundred million of years as the age of the ocean.

Sir Charles Lyell, the eminent English geologist, gave as his estimate of the age of the fossil bearing sedimentary rocks, two hundred and forty millions of years.

Sir Archibald Geikie's estimate was 100 million of years.

Professor J. D. Dana's estimate was 48 million of years.

Professor Joseph Le Conte's estimate was 30 million of years.

Mr. C. D. Walcott's estimate was 28 million of years for the total period of existence of fossil-bearing sediments.

And for the time which has elapsed since the earth was in a molten state the following eminent physicists drew these conclusions:

Sir William Thomson's estimate was 100 million years.

Professor George H. Darwin's estimate was 57 million years.

Professor Simon Newcomb's estimate was 14 million years.

Dr. Alexander Winchell's estimate was 3 million years.

As to the relative durations of the greater geological time divisions the conclusions of eminent scientists are more in accord.

For the Paleozoic (Ancient Life), which includes the Silurian, Devonian and Carboniferous Ages, seventeen million, five hundred thousand years.

The Mesozoic or Mediaeval (Age of Reptiles), seven million two hundred and forty thousand years; and for the Cenozoic or Recent, which is represented by the Tertiary and Post-Tertiary Periods, two million nine hundred thousand years.

"The time since the departure of the ice of the Glacial period from this portion of the continent has been estimated by several eminent authorities, from different data, and their figures fall within six thousand to ten thousand years." *

Prehistoric Man and his Development.

BY DR. LORENZO G. YATES, F. L. S.

Honorary Member Southern California Academy of Sciences.
President of the Santa Barbara Society of Natural History, Etc.

History is defined as a narrative of past events, oral or written, and is divided into Ancient, Mediaeval and Modern. Ancient History treats of the history of man from the earliest records to the destruction of the Roman Empire, A. D. 476; Mediaeval History is the history of the Middle Ages, from A. D. 476 to the beginning of the sixteenth century, and Modern History from the close of the Middle Ages to the present time.

As the above terms apply to the world at large and man in general the study of the history of man as considered in his re-

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* Herman LeRoy Fairchild, in Proceedings of the Rochester Academy of Science, Vol. II.

lations to the groups and divisions of mankind required a different term for its definition, and the late Sir Daniel Wilson, a Scottish-Canadian archaeologist and former President of the Toronto University, coined the word Pre-Historic, using it in the title to his "Archaeology and Prehistoric Annals of Scotland," published in 1851.

This term includes the science of the races of men, their character, history, customs, institutions and language, as derived from sources other than oral or written evidence, and includes that part of Ethnology which relates to the unwritten history of the various races, nations and tribes derived from their relics.

Much has been written, and in all probability much more will be written on the subject of man's origin, and yet but little is known as to How, When or Where man first appeared on the earth.

The Book of Nature, which has thrown so much light on the origin, evolution and age of the lower orders of animals, gives comparatively little evidence which can be utilized for the better knowledge of a subject which is of such interest to the educated portion of humanity.

The "Cradle of the Human Race" has been discovered (?) by many scientists, and by them located in many and widely separated countries, but so far no incontrovertible evidence has been adduced which would give any preponderance of evidence, or even probability to any one of the given localities over the others as regarding the origin of mankind, and it seems more than probable that the locality or localities whence the race or races sprang has been entirely obliterated by changes in the earth's surface, and that the island, continent, or portion of dry land first inhabited by man now forms the bed of one or more of our great oceans.

The late Professor Joseph Leconte in his "A Century of Geology" claimed that "The fundamental idea underlying geological thought is theh istory of the earth.

"That until the beginning of the nineteenth century the earth was not supposed to have any history," it was supposed to have been made at once, out of hand, about six thousand years ago, and to have remained substantially unchanged ever since as the necessary theater of human history.

An effort to crowd all the changes which have taken place in the history of our earth into the period of time given by the Jewish writings as the age of the earth, would be like attempting to force all the water of the Pacific Ocean into a lake.

About the middle of the eighteenth century Buffon brought out dimly the idea of an abyss of time, preceding the advent of man, in which the earth was inhabited by plants and animals wholly different from those of the present day, but the priests of Sorbourne compelled him to retract such irreligious views.

Hutton in the last part of the eighteenth century first clearly concieved the idea that the science of zoology alone is a view of Nature in continuous movement—a life history—an evolution of Nature, all other sciences, including astronomy, being but "flash-light views of Nature."

Lyell showed that "causes now in operation" are producing similar effects under our eyes, of changes which have been going on since the beginning of time.

In the early years of the eighteenth century William Smith laid the foundations of stratigraphy, and Cuvier, by his studies of the wonderful discoveries of extinct mammals in the Eocene Basin of Paris, opened up to the mind of the student in a clearer light the existence of other time worlds before the present one.

It is neither essential nor practicable in this short abstract to follow the various opposing theories as to how the changes in the sea, earth and its inhabitants were brought about, as claimed by Neptunists, Plutonists, Catastrophists and Uniformitarianists, as these opposing factions were eventually reconciled by scientific assimilation.

The Catastrophists held that the whole history of the earth consisted of a series of sudden, violent, supernatural catastrophies which exterminated all life on the globe. These were supposed to be followed by periods of quiet, during which the new earth was re-peopled by direct act of creation, with new forms of life adapted to the new conditions. Species were supposed to have been created at once, out of hand, without natural process. These spread in all directions, and remained unchanged until another universal catastrophe exterminated them.

The great apostles of this theory were Cuvier and Buckland.

Lyell advocated the theory of uniformity of changes in the inorganic world, but he admitted the supernatural catastrophic changes in organic nature. After the publication of Darwin's "Origin of Species," Lyell embraced the new theory, which reconciled the opposing theories, and became generally accepted.

PUBLICATIONS RECEIVED.

"The Codling Moth." Division of Entomology. Bulletin No. 41 U. S. Department Agriculture.

"Olive Oil and its Substitutes." Bureau of Chemistry. Bulletin No. 77, U. S. Department of Agriculture.

"Bee Products in Arizona." No. 48, Agricultural Experiment Station, University of Arizona.

Transactions for December, 1903.

ACADEMY OF SCIENCES.

Los Angeles, California, December 7, 1903.

The regular monthly meeting of the Academy of Sciences was held this evening at 940 South Figueroa Street.

President Comstock occupied the Chair.

The subject for the evening was a lecture on Sweden, by B. R. Baumgardt. The speaker illustrated the subject with 100 lantern views and dealt with the ethnology, history, art and literature of that country.

There being no further business, the meeting adjourned.

B. R. BAUMGARDT, Secretary.

ASTRONOMICAL SECTION.

An unusually interesting and instructive session of the Astronomical Section was held on December 21st, the occasion being a "Herbert Spencer Symposium."

The subject was appropriately introduced by Chairman W. H. Knight, who first presented Dr. Theodore Comstock, president of the Academy, whose theme was "Spencer's Early Papers, Precursors of Recent Scientific Conclusions."

The speaker gave a clear and concise exposition of Spencer's early works, showing the remarkable insight of the great philosopher into the intricacies of nearly all of the sciences, and touching upon the beautiful simplicity and humility of the life that had commanded the respect and reverence of the civilized world.

Rabbi S. Hecht then presented the topic of "Spencer as a Man." He went into the boyhood and early manhood of Spencer, emphasizing his independence of thought and action and his devotion to the logic of principles. He also dwelt upon the encyclopaedic knowledge of the great thinker, and his power to use the knowledge he possessed.

At this stage of the proceedings an unexpected pleasure was derived from the reading by Mrs. Calvert Wilson of a poem in praise of the virtues and achievements of Spencer, written by Mrs. Elizabeth Cheney.

"Spencer's Attitude Toward Metaphysics, and His Contributions to the Science of Astronomy," was the theme of Secretary B. R. Baumgardt's remarks, who, in his usually clear and forceful style, gave a synopsis of the philosopher's views on the more abstruse topics of thought and investigation, and gave him due credit for the substantial aid rendered by him to the sciences of astronomy and chemistry, notably in his attitude toward the nebular hypothesis and the theory of the nature and origin of the universe.

Mr. W. A. Spalding was then introduced, and spoke of "Spencer's Law of the Development of Society." He represented Spencer as "one who set aside Divine revelations except so far as they could be explained on scientific principles," and as "having broken away from the thraldom of religious dogma."

Hon. W. A. Cheney was the last speaker of the evening, and his topic was "Spencer on the Phenomena of the Mind."

Judge Cheney gave high praise to Spencer's system of philosophy, calling it "the philosophic yard-stick of all time to come."

He claimed that Spencer taught the evolution of the human mind and the human soul, as well as of the human body, and that no name of the last century could be compared with his for greatness of conception and magnificence of execution.

In criticism of the English authorities in denying to him burial in Westminster Abbey because of his supposed atheistic sentiments, he said that Spencer was too great for Westminster, and the only appropriate place for his interment was in the world of thought.

The meeting was largely attended and much enthusiastic interest was manifested.

MELVILLE DOZIER, Secretary.

BIOLOGICAL SECTION.

Woman's Club House, Dec. 19th, 1903.

The meeting was called to order by the Chairman of the Section.

The minutes of the last meeting were read and approved.

The lecture of the evening was delivered by Dr. B. F. Gamber, on the subject of "Malaria." The lecture was illustrated by blackboard drawings and by a number of microscopical slides. The microscopes which were used were loaned by the University of Southern California and by the Pacific School of Osteopathy.

The paper was discussed by Mr. W. H. Knight, Dr. Bishop and a number of others.

About thirty-five members and visitors were present.

On motion the section adjourned to meet again on the second Monday evening in January, 1904.

C. A. WHITING, Secretary.

GEOLOGICAL SECTION.

Los Angeles, December 28th, 1903.

The Geological Section of the Academy of Sciences met at the Woman's Club Rooms on the 28th inst.

Wm. H. Knight acted as Chairman pro tem. President Theo. B. Comstock was introduced and gave a very interesting description of the Physical Geography and Geology of Brazil. The lecture was intensely interesting, and many questions were asked by the audience after the lecture was concluded.

G. MAJOR TABER, Secretary.

ARCHAEOLOGICAL INSTITUTE.

There has been organized in Los Angeles the Southwest Society of the Archaeological Institute of America, for the purpose of collecting, preserving and publishing the fast disappearing relics of man and his institutions in this prolific field, aided by the parent institute, of which Professor Francis W. Kelsey, of the University of Michigan, is the Secretary. The officers of this local branch are: President, J. S. Slauson; Vice-Presidents, F. M. Rindge, Dr. Norman Bridge, Colonel H. G. Otis, Rev. George F. Bovard; Recorder and Curator, Dr. F. M. Palmer; Treasurer, W. C. Patterson.

Executive Committee—Dr. Theo. B. Comstock, chairman; Rev. Geo. F. Bovard, Rev. C. J. K. Jones, Dr. F. M. Palmer, Chas. F. Lummis, Professor J. A. Foshay.

A lecture of thrilling interest was given on the evening of December 3rd by Prof. Kelsey, on "Recent Discoveries in Pompeii." Marked interest is shown by our citizens and the membership is rapidly growing. Steps have been taken to conduct researches on the Mexican and Indian folk-lore of this region, and the Executive Committee is now planning for a demonstration on this subject in January, which may come as a revelation to those who have not given the subject attention.

It is most agreeable to chronicle any event in the history of California, which, like this, tends in the general direction of the aims and purposes of the Academy of Sciences.

There should be a general Museum here to conserve and illustrate every phase of the subjects covered by the Academy of Science, the Historical Society and the Archaeological Institute.

Through the direct support guaranteed by connection with the national organization, there is hope of vitality and permanence in the new society, which we bid God speed in its work. The inaugural address of President Comstock, read before the Academy in 1902 and published in the June number for that year, of the Bulletin, contains suggestions for a very similar union of local Academies of Sciences with the American Association for the Advancement of Science, or the Carnegie Institution, or some other national rallying point.

We welcome any movement which tends to vivify and consolidate the energies of those whose labor of love in the cause of Science has been necessarily disconnected and often disheartening in the past.

NOTES AND NEWS.

From experiments conducted at the Montana Agriculture Experiment Station it was found that the evaporation and transpiration from the grain was about 16 per cent greater than the evaporation from the bare soil. For the period named, the former averages 1 1-7 inch and the latter 9-10 inch per week over the surface. For the same period the evaporation from a water surface was 13 to 16 inches per week. . . . The crop in every case not only evaporated all of the irrigation water, but robbed the soil of part of the moisture which it contained at seed time.

The changing of the sex in plants (Trop. Agr., 22 (1903), No. 11, pp. 789, 790).—The possibility of changing the sex of the date palm and of the papaw is discussed. About 80 per cent of seedlings of date palms are male. The method of the Arabs in some of the oases in the southern part of Algeria in changing these male plants into bearing trees is to tear off all the leaves from the foot stalks, at 2 or 3 years of age, so that the medial nerve is split in two from the center to the leaf sheaf. It is believed that this tearing process brings about a concentration of the sap movement in the same way as is the case in annular incisions, resulting in an accumulation of sap, "which is more necessary for the vital functions of the female plant than for those of the male." The writer states that it has been his experience that cutting off the terminal buds of papaw trees (Carica papaya) as soon as the character of the flower is apparent results in altering that character, inducing the tree to yield good fruit in place of the poor specimens borne by the so-called male trees.

Evaporation from a water surface, E. F. Ladd (North Dakota Sta. Rpt. 1902, pp. 20, 21).—Observations were made as follows: "A galvanized iron tank 3 ft. square by 14 in. in depth painted black contained a second smaller tank 12 by 12 by 12 in. in dimensions, likewise blackened. These were sunk in a grass plat level with the surface of the ground. The small tank contained distilled water and this tank within the larger was surrounded with water. Daily measurements were made of the amount of evaporation, and the results by months are given. . . . The total amount of water evaporated from a water surface for the five months, May to September, inclusive, was 28.12 in., or an average of 5.624 in. per month, or a daily average of 0.183 in. The total rainfall for the same period of time was . . . but little more than one-half as much as the water evaporation for the same period, or an average of 2.864 in. per month, or an average daily rainfall of 0.0936 in., as compared with an evaporation of 0.183 in. per day."

The New Zealand Parliament has passed a bill empowering the Governor to introduce after January, 1906, the metric system, which is then to become the system of weights and measures for the country.

The Seismological Commission of the British Association inferred from the data collected that the crust of the earth was not more than forty miles thick, the interior having a very high effective rigidity and the nucleus being probably more uniform in its chemical and physical conditions than was usually supposed.—(Science, Vol. XVIII, No. 464.)

"In Olive Oil and Its Substitutes," there may be found an interesting and accurate analysis of the oils imported into and produced in this country. The following is the summary of the author's investigations:

1. The olive oil consumed in this country is largely imported from France and Italy. The amount produced in California is relatively small, although reports warrant the statement that California is capable of supplying the entire home demand.
2. The cost of production of California oil is so much higher than that of the French and Italian oils that it competes with difficulty with the imported oils in the American market, even after the latter have paid duty amounting to 50 cents per gallon.
3. The retail prices of the best grade of oil from the three sources are much the same, but the average prices of the imported oils are much less than that of the California oil, owing to the large amount of lower grade foreign oils that are marketed in this country.
4. In the examination of olive oils for adulteration, a complete analysis is usually necessary to reveal the real nature of the oil. In cases of gross adulteration the qualitative tests, specific gravity, and index of refraction will often show the nature of the adulterant and the extent to which it is employed.
5. The adulteration of foreign oils imported into this country is practiced to a much less extent than is popularly supposed. Only 5 of the 61 samples obtained from the customs officers were found to contain other than olive oil, and none of these contained cotton-seed oil. On the other hand, oils bought upon the market, bearing labels indicating a foreign origin, were found to be quite extensively adulterated with cotton-seed oil. It seems, therefore, probable that these adulterated oils bearing foreign labels are labeled and modified after leaving the port of entry, neither the domestic nor the foreign producer being responsible for them. This practice is equally injurious to the interests of the California, French, or Italian manufacturer of pure olive oil and the consumer.
6. The results of analyses of oils of known purity show that there is a wide range in the various values ordinarily considered of importance in indicating the purity of an oil. This is especially true of the iodin number, the melting point of fatty acids, and the percentage of solid fatty acids. The California olive oils generally have a higher iodin number, a lower melting point of fatty acids, and a lower percentage of solid fatty acids than the French and Italian oils.
7. All samples containing other than olive oil were sold as pure olive oil, although in one case a careful observation of the label revealed the fact that the oil was an olive oil substitute.

The alfalfa butterfly (Colias eurytheme) has so increased in numbers since 1895 that the honey flow which used to continue well into September is now cut short in July. The adulteration of honey, in Arizona, is not commercially possible for the excellent reason that freight rates so enhance the price of glucose and sugar that these adulterants cannot be profitably used.—("Bee-products in Arizona." By R. H. Forbes.)

The local Historical Society have begun to agitate for State help in the establishment of a building to house their valuable historical books and relics. We have reached that point in civic evolution where a museum is almost an absolute necessity for educational purposes. Our Academy sections alone could in a few years stock a museum with all the representative objects native to the West.

FEB

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BULLETIN

OF THE

Southern California Academy of Sciences

COMMITTEE ON PUBLICATION
A. DAVIDSON, C. M., M. D., Chairman
MELVILLE DOZIER G. W. PARSONS

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Some Contributions to the Phytogeography of Southern California.

There have recently appeared three papers on plant distribution, to which the attention of the botanists of Southern California should be called. They are the following:

Die pflanzengeographische Gliederung Nordamerikas. A. Engler. Notizblatt des K. K. Gart. u. Mus. zu Berlin, Appendix ix. 1-94. (May, 1902).

Notes on Plant Distribution in Southern California, U. S. A. R. E. B. McKenney. Beihefte zum Bot. Centralblatt. x. 166-178 (1901).

A Sketch of the Flora of Southern California. S. B. Parish. Botanical Gazette xxxvi. 203-222, 259-279 (September and October, 1903).

A paper of considerable importance to students of plant geography is the one in which Professor Engler outlines a scheme to serve as a basis for the arrangement of American plants in the royal gardens near Berlin. The American botanist will be most interested in the manner in which he has divided our continent into regions and minor divisions. Its first division is into four regions (gebiete), the Arctic, Subarctic, Atlantic, and Pacific. The Pacific region he subdivides into: (1) the province of Pacific Coniferae, (2) the Rocky Mountain province, and (3) the Western Prairie-, Desert- and Alkali-Steppe province. In the province of Pacific Coniferae he finds a Northern zone and a Southern zone, the latter comprising: (a) the district (bezirk) of the coast forests of California and (b) the forest district of

Western Nevada and the Sierra Nevada Mountains. The Western Desert-Steppe province includes: (a) the transition from the Chaparral and Sonora province of the Central American Xerophyte region to the Mohave and Gila deserts, (b) the Great Basin zone and (c) the Inner California zone.

A brief description of the flora of each of these regions is given and here the numerous errors in regard to the distribution of species are to be charged to the account of American botanists, who are often exceedingly lax in their methods of stating ranges, rather than to that of the author himself. In California there has been so little done in the matter of working out the exact ranges of particular species that we cannot be surprised if foreign botanists are unable to get an accurate idea of the different floral belts of the state. Exhibiting as it does the views of one of the foremost authorities on this subject, the outline given by Dr. Engler will probably serve as a basis for more elaborate treatises on the phytogeography of North America.

In the contribution submitted by Mr. McKenney we have a more detailed account of a very limited region. The author, who was at one time connected with the Santa Ana schools, confines himself to a discussion of the plant formations of Orange County, of which seven are distinguished; the Mountain, Foot-hill, Canyon, River Bed, Mesa, Bog and Strand formations. The principal species occurring in each of these formations are mentioned and the character of the vegetation described. As in other parts of Southern California, the principal factor affecting plant distribution in Orange County is found to be moisture, the conditions of light and heat being relatively unimportant, since they are quite uniform throughout the county. Except in the River Bed formation, soil moisture is of more importance than surface moisture and the amount of available soil moisture is dependant largely upon soil structure. The chemical nature of the soil is a dominant factor on the alkali mesas and along the strand. Among the five species of seaweeds given as belonging to the Strand formation algologists will be surprised to find three which have never before been reported from the Pacific coast! The figures accompanying the paper are too poor to be of any value and the sketch-map is even worse. The paper itself, however, gives one a very good idea of the flora of this interesting region and is a welcome addition to our meager literature.

But by far the most important contribution to the phytogeography of Southern California is a recent paper by Mr. S. B. Parish. Since this report represents the results of nearly thirty years of field work by a botanist who has the ability both to make careful observations and to draw trustworthy conclusions therefrom, it deserves more than a passing notice. After presenting a descriptive account of the region and much necessary information and statistics concerning its climatic characteristics, the author enters into a discussion of the various phytogeographic areas into which it is naturally divided. He finds that the whole of Southern California may be divided into three primary areas. The first of these, termed the Nevadan area from the fact that its flora is in the main a continuation of that of the Sierra Nevada Mountains, extends in a Northwest and Southeast direction and includes all of the truly montane section, as well as all the forests of the territory. To the East and Northeast is a treeless waste, or desert area, while a Cismontane area of open plains and chaparral-covered hills occupies the territory between the Nevadan area and the Pacific ocean. Above the Nevadan area traces of an Arctic-Alpine zone are recognized on Grayback and San Jacinto mountains. The flora of this zone is likewise of northern origin and the reasons for its exclusion from the Nevadan area are not stated. Within the Nevadan area proper three life zones are distinguished: the Hudsonian, marked in general by Pinus flexilis; the Canadian, roughly indicated by Pinus Murrayana; and the Transition, best identified by the presence of Pinus ponderosa. The last of these zones is the most important and includes, besides the pine just mentioned and its variety Jeffreyi, such conifers as Abies Douglasii, Libocedrus decurrens and Pinus Lambertiana.

Just below this pine belt and above the belt of chaparral there occurs what the author terms an intermediate, or true Transitional zone. On the Desert side its most characteristic plants are Juniperus Californicus and Cercocarpus ledifolius, while within its limits such diverse species as Abies concolor and Yucca brevifolia are found growing side by side, as also are Pinus ponderosa and P. monophylla. On the cismontane flank this belt is marked by the presence of Pseudotsuga macrocarpa and Pinus Coulteri, the latter, however, extending well up into the Pinus ponderosa belt. While this intermediate belt is in most places quite narrow the author has done good service in pointing out its presence and characteristics. Although it is spoken of as a "true Transitional zone," it is not to be confused with the broader and much more important zone next above, which has been generally known as the Transition zone.

The Desert area is divided naturally into the Mohave subarea and the Colorado subarea. It is shown that the flora of the former has its extension to the north while that of the latter has its extension toward or into Mexico. The difference in the character of these two floras is found to be due only in part to climatic causes, but is largely influenced by the topography of the region. The Cismontane area exhibits three more or less distinct floras, each of which is indicative of its peculiar subarea.

These subareas are denoted as the Interior, Coastal and Insular. It is interesting to note that the names applied by Merriam to those life zones occupying all of Southern California except the mountains are used by Mr. Parish but once and then only in a chart. Even here they are applied to what are termed regions, the Lower Sonoran region corresponding to the Desert area, the Upper Sonoran to the Cismontane area. According to Dr. Merriam's latest published views most of the Cismontane area would fall within the Lower Sonoran zone. In our estimation it is quite as important to distinguish between the Desert and Cismontane areas as between the Lower and Upper Sonoran zones, although both of these distinctions are not without considerable value. The splitting up of the Desert area into Juniper, Pinyon, Yucca, Larrea and Atriplex "zones" and of the Cismontane area into similar zones and subareas, as proposed by Mr. Parish, will be very helpful to the field student. It will be noted that this use of the term **zone** is not exactly the same as that assigned to it by Merriam, while Engler has used it in a still different sense; and it will be further seen that none of these authors apply the term as did Schimper in his "Pflanzengeographie." If the confusion arising from the use of this much abused term can be avoided in no other way we should like to suggest that these minor divisions pointed out by Mr. Parish be termed **belts**. It seems to us quite proper to speak, for example, of a Juniper belt, a Pinon belt, or even of a Chaparral belt. However, the adjectives used by Mr. Parish in designating the different zones, or belts, are so self-explanatory that there is little danger of confusion, no matter to what noun they may be attached.

A very readable chapter is the one which treats of the adaptation of plants to climatic conditions and no less interesting is the author's discussion of the affinities of the flora. Many other important phases of the subject are carefully worked out and the paper closes with a brief sketch of the cryptogamic flora.

This contribution by one so thoroughly conversant with the distribution of plants in Southern California will serve as a basis for all future work in this territory and the students of our California flora have reason to feel grateful to Mr. Parish, not only for the great amount of field work he has accomplished, but also for the clear and interesting style in which he has presented the results of his observations.

H. M. HALL.

The Bees of Southern California. II.

BY T. D. A. COCKERELL.

When writing on **Dianthidium**, I failed to notice that **Anthidium singulare,** Cresson, and **A. larreae,** Ckll., both belong to this genus. The following table separates those species of **Anthidium** and **Dianthidium** in which the cheeks are partly or wholly yellow, and the yellow of the cheeks is connected by a line (sometimes slightly interrupted in the middle) across the top of the head.

Lateral margins of abdominal segments 2 to 4 produced into hollow processes, which look like spines directed backwards, when seen from above........................... 1

Lateral margins of abdominal segments 2 to 4 normal....... 2

1. First two abdominal segments with the yellow bands divided into spots (Nevada)..**Dianthidium singulare** (Cresson)

First two abdominal segments with the yellow bands deeply notched, but not divided (Southern California)..........
D. singulare var. **perluteum,** v. nov.

2. Pulvillus present; legs red (New Mexico)..............
Dianthidium larreae (Ckll.)

Pulvillus absent; legs yellow and black.................... 3

3. Dorsal pubescence of thorax white (Southern California)
Anthidium serranum, n. sp.

Dorsal pubescence of head and thorax pale fuscous.......... 4

4. Femora with much yellow (Nevada, California)........
A. illustre, Cresson

Femora black (Nevada)...............**A. conspicuum,** Cresson

Dianthidium singulare var. **perluteum,** T. & W. Ckll., n. var.

Female, length 12½ mm., expanse of wings about 24 mm.; clypeus yellow without any central black dot; supraclypeal mark triangular; yellow bands on first two abdominal segments entire (i. e. not interrupted), with large, rounded, sublateral posterior notches; abdomen strongly punctured.

Two collected by Dr. Davidson; Wilson's Peak and Strawberry Valley, California. It is much to be desired that the habits of this remarkable insect should be made known.

Anthidium illustre, Cresson.

Nevada is the type locality. Fowler has described the male from Redlands, California. Dr. Davidson has collected two females and a male at Los Angeles.

Anthidium serranum, n. sp.

Male, length about 15½ mm.; similar to male **A. illustre,** but not so large, and the pubescence, even on thoracic dorsum is white; the color and markings are practically the same in the two species. The last dorsal segment of the abdomen is yellow, and not so deeply notched as in **A. illustre,** the incision being about twice as broad as deep, with rather a curved margin, whereas in **illustre** it is more angular, with straight sides; the median tooth (at the bottom of the incision) is narrow and black, and is separated by a yellow area from the black longitudinal mark at the base of the segment, whereas in **illustre** this tooth is very broad (triangular) and broadly united by a black band with the base of the segment. The genitalia are of the same type in both species, the parts in **illustre** being more robust. **A. serranum** has a yellow mark on the scape, and the third antennal segment shows a yellow spot.

Hab.—Rock Creek, Calif., one specimen taken by Dr. Davidson. Named after Father Serra, the founder of the California missions.

Trypoxylon apicalis Fox--Its Nesting Habits.

BY DR. A. DAVIDSON

This wasp is somewhat frequently met with in the neighborhood of Los Angeles. The young are bred in the hollow stems of plants, the parent apparently utilizing any suitable stem of a medium size. The variable diameter of the stems occupied by this wasp, and the frequent discovery of other species of wasps or even bees, in the same cavity has led me to infer that this species does not usually excavate its own nesting site. The hollow stem adopted is divided into cells by concavo-convex discs of clay, the concavity in every instance facing upwards. These discs are inserted at very irregular intervals, so that the cells vary from half an inch to four inches in length. The cocoons are straw colored, fragile, diaphanous shells one-half inch long, and one-eighth of an inch wide. If, as frequently happens, the cocoon when woven is too small to fill the cavity in which it lies it is not as is most frequently the case with other wasps simply attached to the sides, but is neatly suspended in the center of the stem cavity, so that on cross section it appears like a wheel with the cocoon as a hub and the irregular suspending threads as spokes. The suspending threads are frequently very few in number, in one instance I found it centrally supported by only four threads. The suspending of the cocoon must in this instance have been a delicate operation, though no doubt the erect position of the stem favored its accomplishment. Originally I was under the impression that the food supplied the larvae consisted of caterpillars, as no remains of food were to be found in the cells, but examination of the cells in the early part of the season showed that spiders alone were supplied as food, and these, strange to say, were all of one species, viz., Linyphia. . . . Five to six were the number usually supplied to each cell. All the smaller species of wasps here who feed their young with spiders apparently capture indiscriminately any small species of spider, so that as far as my observations go, this Trypoxolon is unique in supplying one species only. Necessity rather than instinct is probably the explanation of this.

The Trypoxolon appears very early in the season and completed cells may be found as early as February. At this time few spiders have left their winter quarters, but among the earliest to leave are Linphya and these are to be found in numbers at this season. These spiders have, besides a habit of spinning their webs over the water, which renders them more easily observed, and these circumstances probably in a great measure determine the Trypoxolon's choice of this insect as food for its larva.

Prehistoric Man and his Development.

BY DR. LORENZO G. YATES, F. L. S.

Honorary Member Southern California Academy of Sciences
President of the Santa Barbara Society of Natural History, Etc.

In the present state of our knowledge of the history of mankind the word prehistoric is of varied application and uncertain meaning, changing, as it must do, according to the region or country to which it is applied, and the extent of the time which it is supposed to cover, is continually and rapidly being extended by exploration and discoveries.

For a long time Denmark claimed the credit of the discovery of evidence of the existence of man in the ages before written history began. The historic period of Scandinavia began about A. D. 1000, and the earliest examples of history writing in that part of Europe are the Runic inscriptions and poetic legends of that country called "Sagas," inscribed upon stone monuments and other places, which the antiquarians of the past century delighted to study.

This study led to the discovery of the Kjokenmoddings, the Danish name for kitchen refuse, in which were found large numbers of stone implements, weapons and other interesting relics of man's handiwork.

It was found that these relics could be properly divided into three divisions, which would represent three different stages of advancement, called the Age of Stone, Age of Bronze, and Age of Iron.

Each of these ages had continued for a long period, and reached a high degree of perfection, and from these objects much was learned of the early history of man in that region.

In 1853 public attention was called to the discovery of the relics of the Swiss Lake Dwellers of prehistoric times, where different stages of advancement were found, and the further discovery was made that, while the men of ancient Denmark polished their stone implements, there had been a previous race whose implements were only chipped or flaked, and the Stone Age was divided into the Paleolithic or Ancient Stone Age, and Neolithic or Recent Stone Age.

From the time of the discovery of these facts, prehistoric anthropology has advanced to an important rank among the sciences.

It was learned that Egypt and China had written history before the dawn of civilization in Europe, and the historic period for those countries extended back into the more remote ages of antiquity, and more recent discoveries resulting from systematic exploration of the sites of ancient and long buried cities of Assyria and other regions, have demonstrated the use of written characters by which fragments of the history of long forgotten nations and peoples are brought down to us, have carried the Historic Period to and beyond the time when, according to former belief, the world itself had not been formed.

For a long time the markings and hieroglyphics on the ruins and buildings of Ancient Egypt and Assyria were looked upon as mere ornamentation, or evidence of rude artistic taste of the builders, but the long continued study of enthusiastic antiquarians resulted in the discovery that the hieroglyphics were symbolic characters, whose combinations formed picture writings readily deciphered and interpreted, and that other curious combinations of peculiar markings were examples of certain dead languages, used by peoples and nations, whose existence had been previously conjectured from tradition, or casual mention in the mythical writings of antiquity.

One of the most important aids to the interpretation of ancient writings was the discovery of the famous "Rosetta Stone" which contains three inscriptions. The first in hieroglyphic or picture writing—styled by the Egyptians, "writing of sacred words,"—was used on monuments and buildings.

It is the oldest form of writing known.

The second is demotic, the style in general use among the

Ancient Egyptians for decrees and other public acts, contracts and private transactions.

The third in the Greek language, which gave a key to the others.

The inscriptions are to the same purport in each, and were inscribed more than two thousand years ago.

One of the latest discoveries of importance shows that a high state of art, and an advanced degree of civilization existed in the Tigro-Euphrates Valley nearly six thousand years ago. Another was the engraved code of laws of Hammurabi, king of Babylon 2250 B. C., and discoveries and inscriptions showing that a civilized, city-building people built a city on the site of Nippur, the principal city of Babylon, between six and seven thousand B. C.

By the labor and research carried on by the Babylonian Expedition of the University of Pennsylvania, thousands of inscribed tablets have been found, which when fully deciphered, will afford us a first accurate estimate of the remarkable height of Babylonian civilization.

The excavations of this expedition revealed not only the oldest known sanctuary, library and school, but also the most ancient Archaeological Museum.

The earliest inscription found in this ancient museum, though somewhat fragmentary, contains the titles of Sargon I, 3800 B. C., a portion of history written nearly six thousand years ago.

THE EVOLUTION OF MAN, AND HIS MIND

In this age of research and invention, when explorations are being made by individuals, scientific societies, and state and general governments, for the purpose of becoming better acquainted with the world of today; other explorations are being carried on, and a large number of thinking people are turning their attention to the study of the Ancient, or Prehistoric World, and its inhabitants, and the simplest objects unearthed by excavation and explorations made on the sites of ancient, unknown or long-forgotten cities and dwelling places and graves of mankind, are utilized and compared by systematic study in the efforts to gain information relative to prehistoric man, and his advancement from savagery and barbarism to civilization.

It seems but yesterday that aside from the few reliable incidents brought down to us by written history, and the fabulous traditions passed down to us by our ancestors—comparatively nothing was known of nations and races of men who inhabited the earth thousands of years before our written history began.

Man had not discovered nor opened up the Great Book of

Nature, by which geology now enables us to read the history of the earth's crust, and trace the changes which have taken place for unknown millions of years, from the evolution of our planet from its primal gaseous state, to its present solidity.

We find recorded the advent of plant life, followed by that of animals, and the changes in form of the millions of these organisms, which have followed each other in a continuous and unbroken procession to the present day.

As the earth evolved from the gaseous form through varied conditions to the wonderful combination of mineral, plant and animal life of the present, leaving its history imprinted in the rock formations now constituting its crust, and still adding to its rock-written history from day to day, so mankind has evolved from some primal life principle or protoplasm, by a process which we do not understand, and can only attempt to explain by questionable theories and conjectures.

With all our boasted knowledge of the twentieth century, we can no more understand the origin of life than we can comprehend the immensity of space, or an unlimited eternity.

It was but yesterday that man was scarcely the superior of the brute, living in caves, with scarcely a desire beyond the means of satisfying his animal appetite, in which condition portions of the human race are found today.

Other portions, with the advantages of better environment, made more rapid progress and developed intellectual facilities whereby they were enabled to rise above the other orders of animals, and in due time dominated the earth, and formed crude systems of government.

At first brute strength was relied upon, and those endowed with extraordinary courage ruled and enslaved their weaker brethren, and a system of continuous warfare was carried on among communities, and between rival families.

As the mind of man developed intellect, consequent acquirement of useful knowledge by the more intelligent members of communities enabled them to displace those who depended entirely upon their brute strength for their influence over their fellows.

The evolution of the mind generated a desire to possess a method by which their ideas could be communicated to each other.

This desire evolved a system of natural gestures, and eventually a sign language.

It is probable that vocal sounds were used to accentuate the gestures and manual signs. As the necessity of a medium for the exchange of ideas between individuals increased in accordance with the growth of the mind, the crude vocal signs were elaborated and crystallized into words and sentences by which their desires and wishes were made known to each other; and later, incidents and observations made known, and still later, traditions of the historians of their own times transmitted to their descendants, thus forming oral history and traditions which were by this means perpetuated through the ages.

Written history was evolved at a much later period of man's history, commencing with rude outlines of familiar objects pecked on the surfaces of rocks, the wall of the cave dwellings, and the bark of trees. The meaning of these figures would be obvious to all observers.

These figures of animals and other natural objects were afterward modified and conventionalized until historical incidents, geneological histories, and finally, abstract ideas were represented by these modified and conventional figures.

From these simple results of the gradual evolution of man's mind have come all our spoken and written languages, and the comparatively little we know of the wisdom of past ages, and forgotten people.

The knowledge which we have thus obtained comes down to us as incontrovertible evidence of the gradual but cumulative evolution of the mind of man, and the resultant growth of his intelligence and scientific attainments.

Until within comparatively recent times, the inhabitants of European countries considered themselves to be in possession of all the historical and scientific knowledge of the world, and that outside of their limited range of observation very little was worthy of consideration.

The desire for the acquisition of further knowledge as a result of improved education and growth of intelligence, caused some of the more intelligent people to break through the wall of ignorance and superstition which for centuries had enveloped their minds, and some of the more adventurous among them visited regions and countries until then unknown. They discovered that other nations and races of people had advanced to conditions of civilization, which, while differing from their own, were, in some respects, equal if not superior to them.

In many instances, ruins of magnificent temples, erected to unknown gods, and other evidences of the former grandeur of the people who had formerly inhabited the regions.

Even then, the wonderful sculptures and pictorial inscriptions with which many of the ancient works of man in Egypt, Assyria, India, and other countries were covered, were looked upon as unique examples of barbaric art, and supposed to have been intended for ornamentation only.

After enthusiastic archaeologists had, by close observation and long continued study, discovered that the millions of examples of supposed architectural ornamentation were in reality word paintings, recording events in the lives of peoples and their rulers of thousands of years ago, and the scholars of the present, by the discoveries of keys to some of the systems of ancient languages, are enabled to read these records of long forgotten peoples as readily as we read the pages of a book.

PUBLICATIONS RECEIVED.

''Standards of Purity for Food Products.'' U. S. Dept. Agriculture Circular No. 10.

''The Influence of Environment upon the Composition of the Sugar Beet, 1902.'' U. S. Dept. Agriculture, Bureau of Chemistry, Bulletin No. 78.

''The Testing of Road Materials.'' U. S. Dept. Agriculture, Bureau of Chemistry, Bulletin No. 79.

''An Experimental Investigation Into the Flow of Marble.'' Dept. Geology, No. 11, McGill University.

''Muhlenbergia.'' By A. A. Heller. Vol. I. No. 3.

''Some Practical Suggestions Concerning Seed Germination.'' No. 50, Agriculture Exper. Stat., University of Arizona.

''A Brief Account of the Principal Insect Enemies of the Sugar Beet.'' Division Entomology, Bulletin No. 43, U. S. Dept. Agriculture.

''The Colorado Rubber Plant.'' Bulletin Colorado College Museum, No. 1.

Transactions for January, 1904.

ASTRONOMICAL SECTION.

January 18th, 1904.

The meeting of the Section was presided over by Chairman Knight, who introduced the exercises of the evening by remarks on the Leonid meteors of November, 1903, giving extracts from observations in England and points on Continental Europe.

Mr. Knight illustrated on the blackboard a theory of the meteoric phenomena, claiming that the Leonids move in the orbit of a comet, which extends beyond the orbit of Uranus, and that they are probably distributed in bunches or groups throughout the orbit.

That the earth, in its orbital motion, may when it reaches the point of intersection of the two orbits, strike one of these groups, giving rise to an extensive meteoric shower; or it may strike a vacant space between two groups, giving rise to the absence of any large number of meteors.

The chairman also exemplified the interesting theory of the revolution of binary stars about a common center, and the remarkable agency of the spectroscope in determining the direction of stellar movements.

The chairman then introduced Prof. George E. Hale, director of the Yerkes Observatory, as one who had acquired fame as a careful observer and as the inventor of the spectroheliscope.

Prof. Hale displayed many photographs taken at the Yerkes Observatory representing the various instruments in use, the methods of procedure, and a number of the heavenly bodies. He spoke at some length of the work being accomplished in the closer investigation of the composition and characteristics of the sun and other bodies, and of the search being made for atmospheric conditions more favorable to the photographic investigations now being conducted by the Observatory.

That being the special official mission of Prof. Hale to this section of the state, it was gratifying to learn that he had found certain features of this atmosphere in the mountainous regions very favorable to good results, expressing the hope that it would lead to the establishment of a branch of the Yerkes Observatory in this vicinity. Prof. Hale exhibited a mastery of his subject that rendered his remarks lucid, interesting and instructive.

After thanks to the speaker, the section adjourned.

MELVILLE DOZIER, Secretary.

BIOLOGICAL SECTION

Los Angeles, Cal., January 11th, 1904.

The meeting was called to order by the chairman, Prof. A. B. Ulrey. The minutes of the last meeting read and approved.

The first lecture of the evening was by Dr. Louisa Burns on the subject of "The Nissl Bodies." The lecture was illustrated by camera lucida, drawings made by the lecturer, and by a number of microscopical slides made by herself. The lecture gave evidence of the most care-taking and accurate preparation.

The lecture was discussed at considerable length by a number of those who were present.

Ehrlich's hypothesis of immunity was explained at some length by C. A. Whiting. The subject was discussed at length by a large number of the people present.

About forty members and visitors were present. On motion the meeting adjourned to meet again on the second Monday in February.

C. A. WHITING, Secretary.

GEOLOGICAL SECTION.

Los Angeles, Cal., January 26, 1904.

The Geological Section met at the Woman's Club Rooms on the evening of the 25th inst. Minutes of previous meeting were read and approved. The secretary read an article on a recent reported discovery by the use of radium, which claimed that by the radium rays the spirit of a dead animal could be seen passing out of the body after death.

Chairman George W. Parsons then introduced Mr. E. M. Wade, who, with a few remarks, exhibited the action of platinum and hydrogen, showing a red heat when united. Dr. Arthur D. Houghton gave a very interesting and scientific lecture on the line of the radio-activity of metals.

Mr. Wade then exhibited a tube of radium and a specimen of uranium after the meeting was over. The meeting was well attended.

G. MAJOR TABER, Secretary.

NOTES AND NEWS.

The University of California has engaged Prof. Hugo De Vries, of Amsterdam to lecture at the forthcoming session of the Summer School of Forestry. Prof. De Vries has attained much fame by his investigations of plant mutation. He believes that species characters arise suddenly and that they are ordinarily stable from the moment they arise.

Reclamation of drift sands in Cape Colony, C. D. H. Braine (Agr. Jour. Cape Good Hope, 23. (1903).—A description of the extent and character of the drift sands of Cape Colony, with some account of the government attempts to reclaim these areas, and analyses of Eerste River drift sand at different depths and periods. The method of reclamation followed has involved the spreading of town refuse on the sand and the planting of sand-binding trees and grasses. The average cost of five years' reclamation work at Eerste River was $48.74 per acre. The trees found most useful for planting on the sands were Acacia saligna and A. cyclopis. Various species of Eucalyptus have also been planted with more or less promise of success.

"The Fabricia (Leptospernum loevigatum) propagates readily, and is most effective in arresting sands in warm climates. Other useful trees are the Tamarix gallica, Widdringtonia cupressoides, and the Cupressus macrocarpa. . . . Of the grasses used in the Cape Colony, by far the most successful is the Ehrharta gigantea or pypgrass, the vigor of its growth far exceeding that of any other. Perhaps the most useful is the indigenous Triticum junceum, which is being used on the exposed littoral dune at Port Elizabeth, as it thrives we'l near the sea. The Elymus arenarius does not grow freely on the driest parts of the sands, and has, on the whole, shown poor germination, although in some cases healthy and strong. Extensive experiments have been made with marram grass (Psamma arenaria), also known as Ammophila arundinacea and Arundo arenaria, but the results have been very disappointing. . . . Other useful grasses are the Cynodon dactylon and Sporobolus matrella, which were self-introduced at Eereste River and grew vigorously. The Panicum and Stenotaphrum are also indigenous grasses that do well on sandy soils."

In No. 3, Vol. 1. of Muhlenbergia, Mr. Heller describes a number of new labiates from California, chiefly in Monardella and Scutellaria, and has begun a series of papers on "Western Species New and Old." A new Lupine is described by J. W. Congdon.

Experiments at the Michigan Agricultural Station on the warding off of frost by the use of extensive fires of wood resulted in keeping the temperature 2 degrees above the surrounding uninfluenced portion of the orchard.

T. D. A. Cockerell (Bulletin of the Colorado College Museum No. 1) describes a new Picradenia, the roots of which have been found to contain considerable quantities of rubber. The author has reviewed the genus and describes one new species and two subspecies.

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VOL. III. 116836 MARCH, 1904 NO. 3

BULLETIN

OF THE

Southern California Academy of Sciences

COMMITTEE ON PUBLICATION
A. DAVIDSON, C. M., M. D., Chairman
MELVILLE DOZIER G. W. PARSONS

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MAR 30 1904

BULLETIN
OF THE
Southern California Academy of Sciences

VOL. 3. LOS ANGELES, CAL., MARCH 1, 1904. NO 3

A Preliminary Synopsis of the Southern California Cyperaceae.

BY S B. PARISH.

The Sedges have been neglected by most Southern California botanists, and consequently they are represented but scantily in collections. The number of the species, therefore, and their distribution, are known very imperfectly. It seems desirable that our knowledge should be augmented, and made more accurate; and it is to facilitate this end that the present paper has been prepared.

All the species now known to occur in the southern counties are described, and their distribution indicated, so far as the scanty material permits. With the exception of a few rare species, specimens of which I have not been able to see, the descriptions are drawn directly from Southern California plants.

Besides my own material I have had access to that belonging to the University of California, and to the collections of Mr. T. S. Brandagee and Dr. A. Davidson. My thanks are due to Mr. H. M. Hall, and to the two gentlemen named, for this opportunity, and also to Dr. N. L. Britton, Dr. L. H. Bailey and Prof. C. F. Wheeler for valuable assistance.

The plate of Cyperus bromoides is from a drawing made at the New York Botanical Garden, under the direction of Dr. Britton; the drawings for the other plates were made by Miss Clara P. Colgan.

Cyperaceae.

Grass-like or rush-like herbs, with triangular, quadrangular, terete, or flattened, mostly solid, culms, and alternate, mostly radical, leaves with closed sheaths, or leafless. Flowers perfect or imperfect, solitary (rarely 2) in the axles of imbricated bracts **(scales)**, in 1-many-flowered, solitary or clustered spikelets. Perianth hypogenous, of bristles or inner scales, or wanting. Stamens usually 1-3; anthers basifixed, 2-celled. Style 2-3-cleft, rarely simple or 2-toothed. Ovary 1-celled, sessile or stipitate, containing a solitary erect anatropous ovule. Fruit a lenticular or 3-angled achene. Embryo minute, at the base of the copious endosperm.

A family of over 60 genera, and some 3,000 species; of world-wide distribution, but most abundant in the temperate portions of the northern hemisphere.

The two families, the Gramineae, or true Grasses, and the Cyperaceae, or Sedges, constitute the order Graminales, characterized by the production of the flowers in the axles of chaffy scales, which are arranged in spikes or spikelets. In the Gramineae the fruit is a caryopsis, or grain, and the culms are, with few exceptions, hollow; in the Cyperaceae the culms are mostly solid, and the fruit is an achene.

Key to the Genera.

Flowers all perfect; spikelets all similar.
  Scales of the usually flattened spikelets 2-ranked.
    Rachis straight. **1. Cyperus.**
    Rachis flexuous above. **2. Schoenus.**
  Scales of the spikelets spirally imbricated all around.
    Dilated base of the style persistent as a tubercle. **3. Eleocharis.**
    Style wholly deciduous.
      Perianth wanting; style ciliate. **4. Fimbristylis.**
      Perianth of 1-6 bristles, rarely 0; style glabrous. **5. Scirpus.**
      Perianth a minute hyaline scale. **6. Hemicarpha.**
Only the terminal flower perfect. **7. Cladium.**

Spikelets monoecious, androgynous, or rarely dioecious; achene inclosed in a utricle. **8. Carex.**

1. **Cyperus,** Linn. Sp. Pl. 44. Galingale.

Annual or perennial herbs with simple triangular or subterete culms, leafy at base. Infloresence subtended by conspicuous leafy involucres, irregularly umbellate with unequal rays and a sessile central spike, or capitate. Flowers in flattened or subterete spikelets of few or many scales. Scales concave, more or less carinate, 2-ranked, deciduous or persistent, 1-2 of the lowest usually empty. Perianth none. Stamens 3. Style 2-3-cleft, wholly deciduous from the summit of the 3-angled or lenticular achene.

About 650 species are recognized, natives of temperate and tropical regions.

Key to the Species.

Styles 2-cleft; scales deciduous from the persistent rachis.
  Achenes little flattened.
    Achenes oblong. **1. C. melanostachyus.**
    Achenes ovoid. **2. C. bromoides.**
  Achenes plano-convex. **3. C. laevigatus.**
Styles 3-cleft; achenes 3-angled.
  Scales deciduous from the rachis of the flattened spikelet.
    Scales with incurved setaceous tips. **4. C. inflexus.**
    Scales destitute of setaceous tips.
      Wings of the rachis separating to the base; annuals.
        Wings persistent on the rachis. **5. C. erythrorhizos.**
        Wings readily deciduous. **6. C. Parishii.**
      Wings whole adnate to the rachis; perennial. **7. C. esculentus.**
  Spikelets decidous from the axis of the spike.
    Spikes oblong, compact; spikelets slender. **8. C. speciosus**
    Spikes short, loose and spreading; spikelets broader. **9. C. longispicatus.**

Catalogue of Indian Relics Found on Santa Catalina Island; In the Museums of Los Angeles Chamber of Commerce*, The Smithsonian Institute, and Peabody Museum of Archaeology and Ethnology, Harvard University, Cambridge, Mass.

BY MRS M BURTON WILLIAMSON.

The writer acknowledges her great obligation to the following, for a complete list of Santa Catalina Indian relics in the above named Museums: Mr. Frank Wiggins, secretary Los Angeles Chamber of Commerce; Mr. W. de C. Ravenel, administrative assistant United States National Museum, and Prof. F. W. Putnam, curator and Peabody Professor American Archaeology and Ethnology.

OBJECTS IN CHAMBER OF COMMERCE, LOS ANGELES.

EXPLORATION BY DR. F. M PALMER

(The number refers to catalogue number. Those found in shell mounds are marked M., surface finds, S., and those unmarked in graves.)

Bone Implements.

No.
60—Implement 4½ in. long., use unknown.
68—Sword blade, 13½ in. long, 1¾ in. wide.

Ornaments of Stone.

101—Pendant, serpentine.
140—Ring, serpentine.
173—Charm, fossil.

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*The collection in the Chamber of Commerce contains relics from all the islands of Southern California as well as those found on the mainland. Some other islands on this coast are represented by a larger number of objects than Santa Catalina Island. The large local collection was made by Dr. F. M. Palmer and afterward purchased by the Chamber of Commerce of Los Angeles, Cal. The city is greatly indebted to Mr. Frank Wiggins, the indefatigable secretary of the Chamber of Commerce, for his influence in securing these relics and those from the other Santa Barbara islands in Los Angeles county.

No.

174 to 176—Charms, fossils.

240—S. Implement used in the manufacture of soapstone vessels.

241—S. Saw, sandstone.

242 to 246—Polishing stones.

247—Hammer.

250 to 258—S. Chisel points, probably used in making steatite vessels; they are from 2½ to 7 inches in length; were taken from the steatite quarry on the Island.

Shell Ornaments.

293 to 298—A series of beads of the largest sizes, sections cut and ready for being perforated; also a shell **Tivela crassotelloides,** from which they were all made.

317—Pendants, abalone **(Haliotis.)**

333—Dress ornament, abalone.

327—Breast ornaments, abalone.

339—Buttons, abalone.

340—Pendants, abalone.

342—Dress ornaments, abalone.

346—Mosaic inlays, abalone.

348—Pins, columella of a shell.

350—Beads, **Tivela cressotelloides.**

363—Beads, **Tivela cressotelloides.**

377—Necklace, 32 inches long.

Glass and Enamel Beads.

380—Necklace, 78 inches long.

381—Necklace, 84 inches long.

384—Necklace, 77 inches long.

Chipped Stone Implements.

592 to 600—Arrowheads.

606—Pipe, 2¾ inches in length, greatest diameter one inch, a mouthpiece made from wingbone of a bird is fastened by asphaltum in the opening at the small end. Material red sandstone.

612—Cylindrical stone tube 10 inches long, 6 inches circumference. The implement is finely made of black serpentine.

614—Spoon-shaped implement, mottled green and white stone, length 3¾ inches.

615—As above.

623—Mace-head, polished, diameter 2¾ inches, thickness 1 inch, perforations ⅞ inch. Green serpentine.

628—Mace-head, polished on one side. Ornamented on polished surface by incised lines making five crosses. Green serpentine.

No.

637—Fish-stone. Representation of a "fin-back whale."

642—Hook-shaped implement, length 6 inches, width 4 inches, thickness 2 inches. Gray serpentine.

643—As above, length 3½ inches. Serpentine.

644—As above, length 2½ inches. Serpentine.

646—As above, length 1 inch. Serpentine.

662—Spike-shaped implement of close-grained dark sandstone, one of the finest wrought pieces in the entire collection. Dr. Palmer lists this as unlike, in form, anything catalogued elsewhere.

664—Cup, 2¼ inches in diameter, 1¼ inches high, resembles a cup in a saucer. Pink serpentine.

667—M. Cup with handle. Beautifully made. Dark green serpentine.

669—Cup, 4 inches in diameter, 2 inches high. The bottom of this specimen has been carved to make a standard upon which the cup rests. Green serpentine.

Cooking Pots.

680—Griddle or cooking stone, 6 inches in length, 4 in width. Steatite.

681—Griddle or cooking stone, 4½ inches in length, 4 in width. Steatite.

682—Griddle or cooking stone, 5 inches in length, 2½ in width. Steatite.

683—Griddle or cooking stone, 5 inches in length, 4 in width. Steatite.

685—Polishing stone. Serpentine.

686—Polishing stone. Serpentine.

706—Use unknown. Serpentine.

Metates or Mealing Stones.

756—M. Spatula, for use in preparing and applying asphaltum. Shale.

766—Cup of gray serpentine—form like the bowl of a spoon.

772—Discoidal stone of green serpentine, probably a mace-head.

803—Spoon, abalone—**(Haliotis.)**

818—Paint-pot containing black paint. Shell.

823 and 824—Cups of Haliotis, the holes closed with asphaltum.

825—Cake of red paint.

838—S. Unfinished pot. Steatite.

839—S. Pot form—opening just commenced.

838 and 839—From an old quarry on the Island.

Paul Schumacher Collection.

Cat. No.
U. S. N. M.

1,834-51—Soapstone plates, 7 specimens.
18,352-4 —Soapstone cup or mortar? 3 specimens.
18,355-8 —Stone pestles.
188,359 —Stone ring (club head), 1 specimen.
18,360 —Animal figure carved in stone (hind quarters only), 1 specimen.
30,184 —Black flinty pebbles (for money)? 14 specimens.
30,185 —Ear pendants of Haliotis shell, 10 specimens.
30,186 —Bone perforator, 1 specimen.

Dr. W. H. Hall Collection.

15,100 —Unfinished stone mortar.

In the Dall collection from San Miguel Island, numbered 14,984 to 15,072 inclusive, containing mortars, pestles, stone club heads, etc., etc., occurs the following note:

Only a few of these from Santa Catalina Island and those exactly like the San Miguel specimens which compose the rest of the lot.

Explorations Paul Schumacher, Smithsonian Institution, 1875.

Peabody
Museum.
No.

9,268—Cooking stone.
9,269—Cooking stone.
9,270—Cooking pot, small.
9,271—Pestle, small.

Exploration of Paul Schumacher for Peabody Museum, Harvard University, 1877.

Graves at the Isthmus.

Peabody
Museum.
No.

13,116 to 13,122—Double whistle bone.
13,123—Bone whistle 13. Fragments.
13,124—Bone implement.
13,125—Bone implement daggers, 12.

Prehistoric Man and his Development.

BY DR. LORENZO G. YATES, F. L. S.

Honorary Member Southern California Academy of Sciences
President of the Santa Barbara Society of Natural History, Etc.

Among the many interesting discoveries of late years in Assyria is the Code of King Khammurabi, giving the laws which governed his people 4,000 years ago, and there are ample evidences that many of the laws therein codified had been brought down from much greater antiquity.

This Code gives proof of the existence of the tradition of the "mountain-given law" long before the Mosaic reception on Sinai.

At Nippur, the sacred city of the mountain god Bel, the scientific explorations of the ruins of the oldest cities of Chaldea by the party sent out by the University of Pennsylvania, under the direction of Dr. Hilprecht, uncovered twenty-one strata of successive towns and cities upon the site, extending over a period from Arab times, about A. D. 900, to probably a period of 5,000 years before the Christian era, and from the evidence of vestiges of buildings, and the recovery and translations of ancient inscriptions the earliest settlement cannot be placed later than 7,000 years ago.

An important point in this discovery is that there was absolutely no trace of any prehistoric, neolithic, nor paleolithic age, and there was no period during the time of the occupation of this site when writing was unknown, and there was no Stone Age represented in that locality.

This ancient civilization seems to have been brought by emigrants from some other region, among whom writing had advanced beyond the pictorial stage.

Copper and silver were worked by these people and a silver tariff had replaced a corn standard.

Other discoveries to the east of the River Tigris indicate older settlements showing three different stages of the Neolithic or Later Stone Age, showing, either that the emigration had been from the east, and that its advance had been very slow, or that the people living in the Stone Age of the earlier settlement had been driven out by a people who were already equipped with the first elements of civilization which must have taken centuries to develop.

M. W. Flinders Petrie judges from the pictures of ancient men with full foreheads and aquiline noses that in the early man of Egypt we find. a European race more or less mixed with the Negro. He says that there are 9,000 years' unbroken chains of events in Egyptian history, and yet we are far from the beginning. There are traces that civilization must have come in from another country with copper and fine work in flint and stone. and good pottery.

In the earliest graves, figures of a race of the Bushmen type were found similar to those found both in France and Malta, suggesting that the race may have extended over Africa into Europe. There were figures of captive women of the earlier race which were Paleolithic.

Aside from all tradition it would seem that the portion of the earth's surface now occupied by the South Pacific ocean was once dry land, of which portions of Australasia and some of the islands represent all that now remains of a once immense continent which has been destroyed by volcanic action, which is still at work with diminished force.

The researches of geologists have shown that extensive areas of the dry land of the present have been, and still are, covered by volcanic matter, the source of which cannot be satisfactorily accounted for. The known extinct and active volcanoes are sufficient to account for but a small proportion of the great number and extent of ancient overflows.

The great lava flow of the northwestern portion of the American continent covers Northern California, part of Nevada, Oregon, Washington, Oregon, Idaho, and far into Montana and British Columbia. It is said to cover not less than 150,000 square miles, and in some places more than thirty successive layers are shown, extending in some places to a depth of perhaps 3,000 feet. In India 200,000 square miles are covered from 2,000 to 6,000 feet thick without a visible volcano from which the lava could have come.

Where there are great eruptions of melted matter from the interior of the earth there must result corresponding cavernous chambers beneath the surface, which upon the ingress of the waters of the ocean are, by contact with the incandescent heat, changed into superheated steam, with incalculable explosive power sufficient to destroy islands and portions of continents.

Many such instances have occurred within historic times and where the earth's crust is thus displaced the water of the ocean fills the depression.

An instance of remarkable volcanic energy in historic times is presented by the blowing off of a volcanic cone called Papandayang in the Island of Java, by which it is estimated that about thirty billion cubic feet of material was thrown into the atmosphere in a single night, the mountain was reduced from its height of 9,000 feet to 5,000 feet and a vast crater left in its midst.

*Ency. Brit.

If such results are possible in the present comparatively feeble action of volcanic force, it seems probable that in the earlier periods of the earth's history, intermittent catastrophic action resulted in immeasurably greater destruction of the earth's surface.

When we consider that nearly all of the present dry land of the earth consists of marine deposits of material derived from older formations of rocks thousands of feet in thickness, the question arises, **Where** were these older formations located, and **What** has become of the remnants?

We know by incontrovertible evidence of the rocks and their inclosed fossil remains that the earth's crust has been subjected to continuous alternations of elevation and depression, and what was dry land as continents and islands in one period of the earth's history became the bed of the ocean in another period, and new islands and continents were raised from the bed of the former ocean, bringing up its records. The records of the animal and vegetable life of the submerged land were buried in the bed of the new ocean, there to remain for perhaps millions of years, until the wheel of time shall bring them again above the ocean level, and supply some future race with many of the missing pages of the Book of Nature.

Among these missing pages it is probable that the records of man in the earlier stages of his evolution may be buried.

What would be the result should the continents of the present be submerged, leaving only portions of the highest ranges of mountains and islands above the surface of the water?

The thickly populated countries would be absolutely destroyed, a few human beings might escape the catastrophe, and proceed with Nature's plan of evolution, as it has always been.

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PUBLICATIONS RECEIVED.

"Wheats and Flours of Aristook County." Maine Agricultural Experiment Station. Bulletin No. 97.

"Fourteenth Annual Report." University Arizona Experiment Station.

"Some Insects Attacking the Stems of Growing Wheat, Rye, Barley and Oats." U. S. Department Agriculture. Division Entomology. Bulletin No. 42.

Transactions for February, 1904.

ACADEMY OF SCIENCES.

Los Angeles, Cal., February 1, 1904.

The regular meeting of the Academy of Sciences was held at the Club House. President Theo. B. Comstock and Secretary B. R. Baumgardt being absent, Professor Melville Dozier was called to the chair and G. Major Taber appointed secretary pro tempore.

The chairman announced that at the regular meeting in April the following officers would be elected:

President, Vice President, Secretary and four members of the Board, and that at the regular meeting in March the names suggested by the Board would be announced, subject to the ratification of the Academy.

The chairman further announced that at the meeting of the Astronomical Section, February 15, Professor G. E. Hale would deliver a lecture.

Professor Julius Koebig was then introduced and gave an interesting lecture on "Food and Food Products and Their Adulterations."

He opened his remarks by stating that: "Life is an undiscovered mystery, and it is necessary to study chemistry to obtain the best results for sustaining it." He also stated that with strict vegetable diet there would be on an average 15 days sickness in the year, while with a mixed diet the number of days would be reduced to three.

He explained by charts the relative nutriment contained in both vegetables and meats.

The lecture was scientific and instructive. Questions were asked by the audience and answered by the speaker. Several members of the Chemical Club were present.

Adjourned. G. MAJOR TABER, Secretary pro tem.

Los Angeles, Cal., February 1, 1904.

The Board of Directors of the Academy of Sciences met at 7:30 p. m. at the Woman's Club Rooms. Present, Wm. H. Knight, Melville Dozier, George W. Parsons and C. A. Whiting.

President Theo. B. Comstock and Secretary B. R. Baumgardt being absent, Professor Melville Dozier was appointed chairman and G. Major Taber secretary pro tem.

The following applications were read, and by a vote of the board were elected to membership:

M. R. Preston, 412 South Hope street, Los Angeles.
A. G. Adams, 906 West Seventh street, Los Angeles.
L. H. Banister, Station "A," Pasadena.
Paul F. Mohr, 423 Byrne Building.
G. W. Vosburg, 1242 West Lake avenue.
Mrs. Sophia A. P. Wheeler, San Gabriel.

Mr. William H. Knight and Dr. Albert B. Ulrey were appointed a committee to confer with the Chemical Club in regard to forming a union of their club with the Academy of Sciences.

There being no further business the board adjourned.

G. MAJOR TABER, Secretary pro tem.

BIOLOGICAL SECTION.

The meeting was called to order by the chairman of the section, A. B. Ulrey.

The minutes of the last meeting were read and approved.

The lecture of the evening was delivered by Dr. Lyman Gregory on "The Ontogeny and Phylogeny of the Eye." The lecture was illustrated by careful drawings made by Dr. Gregory's pupils.

The lecture was discussed at some length by Professor Ulrey and C. A. Whiting.

A number of slides showing sections of various eyes were exhibited under a microscope.

About thirty members and visitors were present.

On motion the meeting adjourned to meet on the second Monday evening in March. C. A. WHITING, Secretary.

ASTRONOMICAL SECTION.

The occasion was a joint meeting of the Astronomical Section and the Academy, to hear Professor Hale of the Yerkes Observatory in his intensely interesting presentation of the properties and characteristics of the sun.

The speaker was introduced by Secretary B. R. Baumgardt, and opened his remarks by allusions to the striking changes through which observatories have passed in recent years, being now more of the nature of laboratories than of places for mere observation.

The lecturer paid a high tribute to the extent and value of the astronomical work being accomplished in America, and especially of that part which has been and is being contributed by California's great observatory, the Lick.

Professor Hale then introduced the subject proper of his address, the composition and phenomena of the sun, and for an hour and a half delighted and instructed his audience with an exposition of the methods of procedure and the marvelous results obtained in the persistent and arduous investigations that have been conducted at the Yerkes and other observatories, bearing upon the chemistry and physics of the sun.

The lecture was richly illustrated with stereopticon views, taken largely under Professor Hale's own supervision and exhibiting the tremendous possibilities of the spectrohelioscope, an instrument growing out of his own genius and application. After the lecture an informal discussion ensued, during which many questions of interest were asked and answered.

To the great gratification of the audience, Professor Hale spoke in the highest terms of the atmospheric advantages of the mountainous regions of this vicinity for solar observation, expressing the hope that arrangements for a permanent observatory of this character may be established in this neighborhood.

A hearty vote of thanks was tendered to the lecturer for his lucid and instructive exposition, and the meeting adjourned.

February 15, 1904. MELVILLE DOZIER, Secretary.

GEOLOGICAL SECTION.

Los Angeles, Cal., February 22, 1904.

The Geological Section met at the Woman's Club Rooms at 8 p. m. Chairman George W. Parsons called the meeting to order. The minutes of previous meeting were read and approved. The chairman then introduced Professor Frank I. Shepard of the University of Southern California, a member of the Chemical and Metallurgical Club of Los Angeles, who read an interesting paper on "The Chemical Geology of Sedimentary Deposits."

He said in part, that chemistry had always played an important part in building up the earth's strata which usually occurred near the surface, and that the rivers carried much of this material into the sea, and the larger material was deposited near the shore, and the finer matter was carried further out. He also stated that mineral substances were held in solution, and that in the Lake Superior region the iron was deposited chiefly by precipitation. He asserted that it was estimated that 100 tons of rock material per square mile were dissolved by rain water every year into the sea, and that limestone was formed in vast quantities on the ocean floor, mostly between the surface and at a depth of 2000 fathoms and remarked that limestone played no small part in the formation of iron ores as a carbonate or sulphate being derived from the decomposition of pyrites and other iron-bearing minerals. He quoted several prominent authors who substantiated the opinions advanced. He also stated that the area of the ocean floor was estimated to cover 103,000,000 square miles, and that dead marine animals probably covered the ocean floor six feet in depth for many square miles. He also gave the reports of 160 analyses of sea water collected by the Challenger expedition; stating that of deep-sea deposits on the floor of the ocean, 36.83 were carbonate of lime, and that 90 per cent. was derived from pelagic organisms, and that below 3000 fathoms very little limestone was deposited; that a large percentage of silica is being formed from diatomaceous and radiolarian oozes; that metamorphism changed nearly every kind of sedimentary rock.

There was a general discussion by members and questions were asked and answered by the speaker. The lecture was interesting and of a purely scientific character.

The chairman thanked Professor Shepherd for his interesting and instructive lecture. G. MAJOR TABER, Secretary.

NOTES AND NEWS.

One eucalyptus tree, **E. naudiniana,** Muller, has been discovered in Mindanao, the most southern of the Philippine Islands (Science No. 457).

Southern California has the distinction of producing some of the most interesting mineral gems that have been discovered of late. Dr. Kunz, at the New York Academy of Sciences, reported the following: Magnificent colored tourmalines from San Jacinto, Mesa Grande and Pala; rose beryl also from the latter localities; lilac spodumene from Pala and Coahuila; spessarite, a garnet of remarkable beauty, from Coahuila and from San Diego; kunzite "in crystals, which for purity and beauty of color are unrivaled by any other mineral in North America."

At Ramona, near San Diego, crystals of pale blue topaz have been found that resemble those of the Ural region. This is the first noted occurrence of this mineral in the state.

The greatest amount of salt detected in beach sand occurred in a sample taken at Los Angeles, 0.15 for the first foot and 0.12 for the second foot, an amount not greater than that sometimes occurring in cultivated land in the United States. We are therefore constrained to attribute the xerophytic character of sand-strand vegetation to factors in the environment other than the presence in the soil of an excessive amount of soluble salt. (The Salt Content of Seabeach Soils. T. H. **Kearney.**)

MAY 3

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MAILED APRIL 16, 1904

A Preliminary Synopsis of the Southern California Cyperaceae.

BY S. B. PARISH.

* *Styles 2-cleft; achenes lenticular; rachis wingless; spikelets in a simple umbel, or capitate.*

+– *Scales folded and sharply carinate*; *achenes little flattened*; *annuals.*

1. **Cyperus melanostachyus,** HBK. Nov. Gen. 11:207. **C. diandrus capitatus,** Britton, Bull., Torr. Club, **13:205.. C diandrus castaneus,** Watson, Bot. Cal. 2:214.

Culms slender, 4dm. or less tall, about equalling the narrow leaves; spikelets linear-oblong, much flattened, many flowered, 6-10mm. long; involucral leaves mostly 3, narrow, 1-2 of them much elongated: scales ovate, obtuse, 2mm. long, dark brown with pale or green keel; stamens 2-3; achenes oblong, subacute, gray, half as long as the scale.

Common in wet soil, stream banks, etc., in the cismontane region below 1,500 feet altitude. Los Angeles; Braunton, Davidson. San Bernardino; Parish.
by Dr. Britton.

2 **Cyperus bromoides,** Britton, nom. nov. **C. unioloides**

bromoides, C. B. Clarke, Jour. Linn. Soc. 21:60. Britton, Bull. Torr. Club, 13:206.

Culms slender, 4-8dm. tall, exceeding the few rough-margined leaves; spikelets 4-12, lanceolate, flattened, 10-20-flowered, 8-18mm. long; involucral leaves 2-4, the longest 1-1.5dm. long; scales acute, yellow-brown, the green keel 3-nerved, and the margins scarious, about 4mm. long; stamens 3; achenes ovoid, black, about one-third as long as the scale.

Cienega, Los Angeles Co., 1884; Oliver. Near Los Angeles, Aug. 24, 1888, Dr. Hasse. The first of these specimens is in the Gray Herbarium of Harvard University; the second is in the Herbarium of the New York Botanical Garden. The plant is widely spread through Mexico and Central America, but in the United States is known only from the above collections.

PLATE II. **Drawn from Dr. Hasse's specimen.**

+† *Scales concave, only slightly carinate; achenes biconvex; inflorescence a sessile and apparently lateral cluster of few spikelets.*

3. **Cyperus laevigatus,** Linn. Mant. 2:179.

Perennial from a wiry rootstock; culms few from each node, subterete, about 1dm. tall, hardly surpassing the erect filiform leaves; spikelets 1-3, ovate, 3-8mm. long, 6-18-flowered; involucral leaves 2, one erect and apparently continuous with the culm, the other very short; scales broadly ovate, obtuse, nearly nerveless, 2mm. long, pale and more or less tinged with rich brown; stamens 3; achenes ovoid, 1.25mm. long, brown and shining, rachis broad, deeply pitted transversely.

Along streams in wet sand. Los Angeles; Davidson. San Bernardino, below 2,000 feet altitude, and Big Morongo, in the Colorado Desert, 3,000 feet altitude; Parish. A species widely distributed in warm countries, but in the United States known only from our region.

** *Styles 3-cleft; achenes 3-angled,*

+ *Scales falling away at maturity from the persistent rachis of the flattened spikelet.*

‡ *Scales tapering into a curved setaceous tip; wings inconspicuous; stamen 1.*

4. **Cyperus inflexus,** Muhl. Gram. 16 Britt. & Brown, Stamen 7. Ill. Fl. 1:137. **C. artistatus,** Boeckl, Linnaea, 35:500, not Rottb. Watson, Bot. Cal. 2:214.

Annual; culms numerous, slender, 2-6cm. tall, about equalling the narrow leaves; inflorescence in a dense head, or 2-3-rayed; involucral leaves 2-3, moderately unequal, 1-6cm. long; scales lanceolate, concave, strongly nerved, green, 1-5mm long; achenes oblong-obovoid, mucronulate, brown, dull, 1-1.5mm. long.

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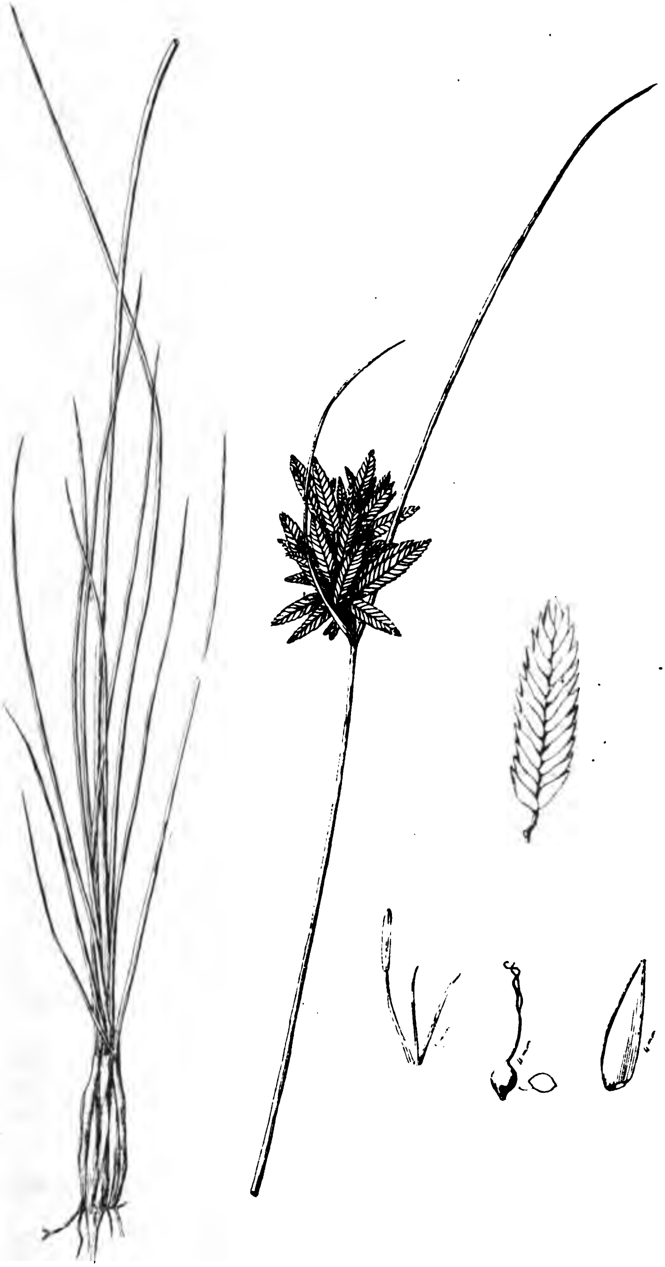


PLATE II

Cyperus bromoides, Britton.

Widely distributed, but nowhere abundant; ascending the mountains to 5,000 feet altitude, and reaching the borders of the Mojave Desert. Strawberry Valley, San Jacinto Mountains: 2623 Hall. San Juan Hot Springs; Nevin. Wet sand banks, Lytle Creek, near San Bernardino, and Mojave River, near Hesperia; Parish. From Ontario and British Columbia to Florida and Mexico.

‡‡ *Scales acute or obtuse, without setaceous tips; stamens 3; umbel with elongated rays, or rarely condensed.*

‖ *Wings scarious, soon separating from the rachis to the base; annuals.*

5. **Cyperus erythrorhizos,** Muhl. Gram. 20.

Culms rather stout, 1-10m. tall; leaves about 5mm. wide, rough margined, usually exceeding the culms, those of the involucre 4-6, one or two of them much exceeding the rays; umbel simple or compound, few-rayed; spikelets 1-1.5mm long, linear, acute, numerous in the elongated oblong spikes; scales narrowly oblong, 5mm. long. acute, mucronulate, bright chestnut; achenes sharply three angled, oblong, pointed at both ends; half the length of the scale.

Reported in the Botany of California to have been collected "in the Colorado Valley," by Newberry. An immature specimen of Alderson's from San Diego Co., may belong here. From Northern Mexico to the borders of British America.

6. **Cyperus Parishii,** Britton, n. sp.

"Annual with fibrous roots; culms tufted, slender, 1-2.5dm. tall; leaves 2-5 mm. wide, shorter than the culm, those of the involucre 2-7, the longer ones exceeding the inflorescence; umbel simple or somewhat compound, usually several-rayed, but sometimes congested, the rays 0.5-5cm. long, slender; spikelets numerous, densely short-spicate, linear, acute, 12-20mm. long, about 2mm. wide; rachis at length wingless, the narrow wings early deciduous; scales oblong, lanceolate, purple-green, obtuse, about 2mm. long, several-nerved; achenes narrowly obovoid-oblong, nearly black, obtuse, mucronulate, about half as long as the scale, obtusely trigonous.

"Southern California to Arizona and New Mexico. Type, Parish, n. 3816, vicinity of San Bernardino, California, October 15th, 1895." (Britton in lit.)

Growing in wet sand, on the banks of streams. Besides the type, we have it from Rock Creek, Los Angeles Co.; Davidson, and Edgar Canon, 3,500 feet altitude, San Bernardino Mountains; 1887 Parish.

PLATE III. Plant collected at San Bernardino, X ½ – a. Scale X 10. b—Achene X 25.

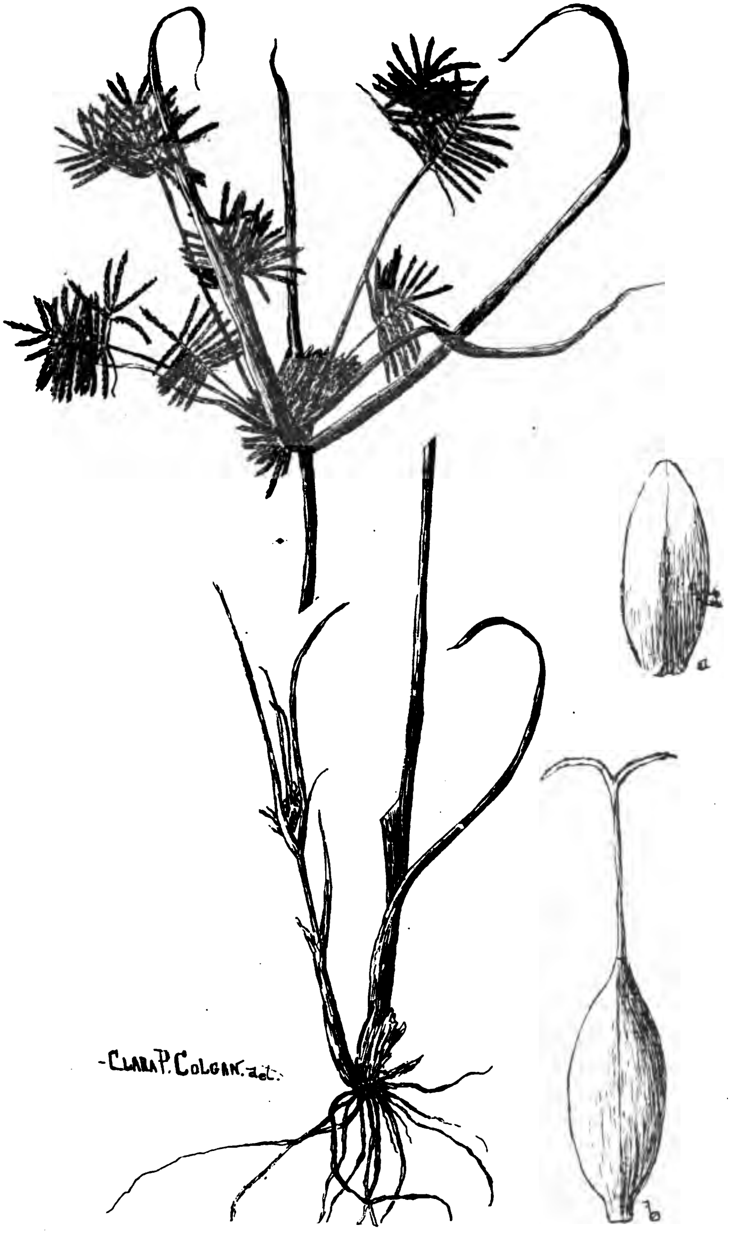


PLATE III

Cyperus Parishii, Britton.

‖ ‖ *Wings persistently attached to the rachis for their whole length; perennial by tuber bearing root stocks.*

7. **Cyperus esculentus,** Linn. Sp. Pl. 45. Britt and Br. Ill. Fl. 1:241. **C. phymatodes,** Muhl. Gram. 23. Watson, Bot. Cal. 2:215.

Culms stout, 3-8dm. tall; leaves about 5mm. wide, shorter than the culms, those of the involucre usually 4, the longest exceeding the rays; umbel 7-10-rayed, often compound, the rays up to 1dm. long; spikelets numerous in loose, spreading spikes, 5-20mm. long, 10-20-flowered; scales yellowish brown, ovate subacute, several nerved, 4mm. long; wings narrow, shorter than the achene, only the pointed tip at length free; achenes oblong-obovoid, 1-1.5mm. long, mucronulate at the obtuse summit.

In dry, sandy soil along streams, or a weed in cultivated grounds. Apparently of wide range in the cismontane region below 1,000 feet altitude, but not abundant. Los Angeles; 630, 671 Braunton. Tia Juana; 961 Alderson. San Bernardino; 2227 Parish. Cosmopolitan, and perhaps not indigenous in our region.

†† *Spikelets narrow, subterete, readily detached from the axis of the spike, the lowest pair of scales persisting; wings broad, scarious, wholly adnate to the rachis, and loosely embracing the achene; stamens 3; annuals.*

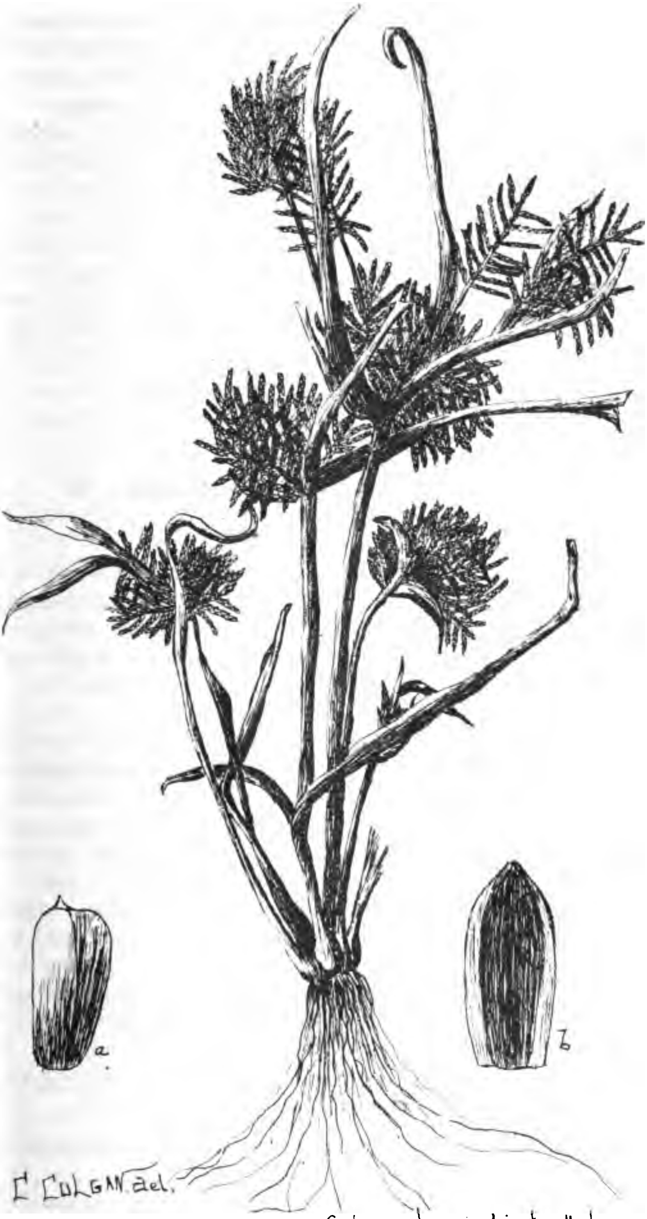
8. **Cyperus speciosus,** Vahl, Enum. 2:364. Britt. and Br. Ill. Fl. 1:242. **C. Michauxianus,** Schultes, Mant. 2:123. Watson Bot. Cal. 2:215.

Culms 1-5dm. tall; leaves rough-margined, 4-6mm, wide, not exceeding the culms, those of the involucre longer than the rays; umbel usually crowded, compound, the rays few and short, not greatly unequal; spikelets narrowly linear, 5cm. long, in an oblong spike; scales ovate, subacute, 2mm. long, pale or greenish, with brown margins; achenes pale, oblong-ovoid, half the length of the scale.

Temescal; Nevin. Los Angeles River; 578 Braunton, Davidson. New England to Florida, west to Nebraska, Texas and Southern California.

9. **Cyperus longispicatus,** Norton,, Trans, St. Louis Acad. 12:37, t.5. Small, Fl. S. E. U. S. 1321. **C. ferox,** Watson, Bot. Cal. 2:216, not Vahl.

Culms 3-5dm. tall; leaves 1-1.5cm. wide, strongly channeled, rough on the edges, shorter than the culms, those of the involucre 4-6, as long as the rays, or longer; umbel compound, loose and spreading, as are the short spikes, the primary rays 6-10, 3-8cm. long, or the umbel condensed or pseudocapitate; spikelets



Cyperus Longispicatus, Norton.

PLATE IV

linear, 1-1.5cm long, 6-8-flowered; fertile scales oblong, 3mm. long, obtuse, stramineous, the midvein green, folded, but at maturity only concave; achenes oblong 1-1.25mm. long, 1mm. thick, very obtusely 3-angled, the obtuse apex mucronulate.

Growing in wet sand along streams; probably common in the cismontane region, below 1,000 feet altitude, but my only specimens are of my own collecting at San Bernardino, where it is abundant, and at Elsinore Lake. Dr. Britton has obliged me with a part of Norton's type specimen, 1248 B. F. Bush, from San Antonio, Texas. The spikelets are 2.5cm. long, but otherwise the plants do not differ from my own. Immature achenes are acutely 3-angled, and acute at both ends, but when fully mature they are as described.

PLATE IV. From a plant collected at Elsinore Lake. X ½ – a. Achene X 15 – b. Scale X 8.

The Bees of Southern California. III.

BY T. D. A. COCKERELL.

The following table is intended to separate the males of the common type of **Anthidium** represented by **A. maculosum, mormonum, montivagum, cognatum, &c.**, in various parts of the United States. In addition to the species of Southern California, I have included some others for comparison, two (from Pecos, New Mexico) being new. There are also included some species of a type not yet found in our region, one of them **(toltecum)** being a **Dianthidium**. I have a residue of females from Southern California which I have not cared to describe, as it seems best to describe the species, so far as possible, from the males, which possess the strongest characters. No doubt further investigation will show that some of the undescribed females belong with described males, and when this is not the case, the males may be discovered, permitting a more exact definition of the characters of the species. It is to be understood that all the new forms are black bees ornamented with yellow, the abdomen having notched or divided bands, the notches always anterior except on the first segment, where they are posterior.

Anthidium; Males.

Last abdominal segment deeply notched, without a median projection 1
Last abdominal segment, with a median projection...... 2
1. Margin of sixth segment sinuate (Mexico)..**toltecum, Cress**
Margin of sixth segment with a strong median tooth, and also lateral teeth (Europe).......**oblongatum, Latr.**

2. Lateral lobes of last segment spine-like, pointed........ 3
Lateral lobes of last segment broadened............... 5

3. Lateral lobes strongly curved; mesothorax with yellow marginal marks (Europe)...............**manicatum,** L.
Lateral lobes straight; mesothorax all black............ 4

4. Size large; clypeus with two black spots on upper part; anterior tarsi largely light yellow in front (So. Calif.) ....**banningense,** n. sp.
Size smaller; clypeus all yellow; anterior tarsi black in front. (Pecos, N. M.)................**lupinellum,** n. sp.

5. Light markings of abdomen confined to sides; size large (Europe) ....**laterale,** Latr.
Light markings of abdomen not confined to sides....... 6

6. Last segment of abdomen ferruginous.................. 7
Last segment of abdomen not ferruginous.............. 8

7. Yellow of abdomen very bright; the bands continuous in the middle on third and following segments (So. Calif.) ....**tricuspidum,** Prov.
Yellow of abdomen pale; none of the bands continuous in the middle; venter of abdomen red (New Mexico) ....**porterae,** Ckll.

8. Lateral lobes of last segment entirely black, divergent and strongly curved inwards at the end; none of the abdominal bands united in the middle (Calif.)..... ....**californicum,** Cress.
Lateral lobes not so; when entirely black, insect smaller. 9

9. Tegulae yellow and black, or rarely yellow and reddish..10
Tegulae entirely apricot-color (So. Calif)..**palmarum,** n. sp.

10. Mesothorax entirely black; last abdominal segment entirely black, or with small yellow spots; a small yellow spot above each eye...........................11
Mesothorax with some yellow on margins; last abdominal segment with conspicuous yellow markings, or nearly all yellow 14

11. Lateral lobes of apical segment short and very broad, of the general type of **A. jocosum**; average size of insect smaller (So. Calif.)............**palliventre,** Cress.
Lateral lobes of apical segment elongated, of the general type of **A. cognatum**; average size of insect larger.12

12. Markings of abdomen orange; abdomen shining, with sparse punctures (So. Calif.)...........**saxorum,** n. sp.
Markings of abdomen yellow; abdomen more closely punctured 13

13. Tibiae with broad yellow stripes (So. Calif.)........ ....**collectum,** Huard.

Tibiae without such stripes (Fort Collins, Colo.)..................... **(emarginatum,** Say, var?) TITUSI. nov.

14. Femora with conspicuous red patches; flagellum red beneath; hair of head and thorax all white (New Mexico).............................. **paroselae, Ckll.**

Femora without red patches; flagellum all black........15

15. Hair of thoracic dorsum white; size small.............16

Hair of thoracic dorsum fulvus or ochraceous..........17

16. Scape all black (So. Calif.)..**bernardinum** var. **fragariellum**

Scape yellow in front (So. Calif.).**bernardinum** var. **aridum**

17. Markings of abdomen lemon-yellow (Pecos, N. M.).................................... **pecosense,** n. sp.

Markings of abdomen orange........................18

18. Size small, about 11 mm. long (So. Calif.).. **bernardinum,** var. **wilsoni**

Size larger, about 14 mm. long (So. Calif.).. **bernardinum,** n sp.

Anthidium banningense, n. sp.

Male: Length, 14½ mm.; black, the markings rather pale yellow, pubescence white, abundant on upper part of head and thorax. Clypeus, lateral face-marks, mandibles except apex, and oblong marks above tops of eyes, pale yellow; clypeus with two black marks near its upper margin; anterior margin of clypeus without notches or protuberances; mandibles with the apical tooth broad, pointed, falciform, but the others hardly developed, the second only a distinct nodule; antennae entirely black; thorax entirely black, only the tegulae with a pale yellow patch; wings only moderately stained with brown; first recurrent nervure joining second submarginal cell some distance from its base; basal nervure passing considerably basad of transverso-medial; legs robust, black, anterior tibiae with a small yellow spot near apex, middle tibiae with a large apical mark, basal joint of tarsi light yellow on the outer side; abdomen with the band on first segment divided into spots (the middle pair small), the others nearly (or quite) divided, the second interrupted in the middle line, the third to fifth only emarginate, sixth segment with two yellow marks, apical all black; segments much more closely and regularly punctured behind the bands than before them; sixth segment with large lateral curved black teeth; lateral processes of apical segment straight or almost so, narrow and pointed; ventral surface of abdomen dark reddish.

Hab.—Banning, Calif., 1892. One taken by Dr. Davidson.

Anthidium lupinellum, n. sp.

Male; length about 11 mm.; a rather small, compact species, with all the abdominal bands divided into spots as in **A. maculosum**; pubescence white, some blackish on scutellum, and vertex, and especially just behind ocelli; clypeus bright lemon yellow, not spotted, not at all obscured by hair, its narrow lower edge black; lateral face-marks, mandibles except apex, and small spot above each eye, yellow; first and second mandibular teeth broad and sharply pointed; antennae entirely black; thorax all black except two small yellow marks on scutellum; tegulae with a large yellow spot in front and a small one behind; wings not very dark; legs black, with the basal joints of the middle and hind tarsi cream-color (but basal joint of anterior tarsus is black); abdominal segments with thin marginal fringes of black hair; sixth segment with four spots like the others, seventh all black; lateral apical processes long and narrow; venter of abdomen black.

Hab.—Pecos, New Mexico, at flowers of **Lupinus** near Harrison's store, June 30, 1903, collected by W. P. Cockerell. By the structure of the last two dorsal abdominal segments, this is closely related to **A. banningense**; but it is smaller and differs in several particulars.

Anthidium tricuspidum, Provancher.

Los Angeles, Calif., three collected by Dr. Davidson. Provancher's description is incomplete, but as his material was from the same locality, and the rather peculiar bright yellow pattern of the abdomen agrees, I assume that I have the insect he described. The ventral surface of the abdomen is light ferruginous.

Anthidium californicum, Cresson.

Los Angeles, Calif., five collected by Dr. Davidson. In these specimens the hair on vertex and thorax above is white, not dull yellow. I have not seen authentic material of **A. californicum,** but the Los Angeles insect fits the description so nearly that I assume it to be the same.

Anthidium palmarum, n. sp.

Male; length about 9 mm.; pubescence white, dense on face, covering clypeus; clypeus and very small lateral face-marks (separated from orbital margin), mandibles except tips, and small spots above eyes, light yellow; mandibles with first and second teeth acute; antennae entirely black; thorax all black except an interrupted yellow line on scutellum; tegulae a warm red; wings rather clear; legs black, marked with light yellow and ferruginous, the lighter colors including the knees, stripes on anterior and middle tibiae, and spots at base and apex of hind tibiae, the last also being reddish behind; basal joint of tarsi yellow, the other joint light ferruginous; the tibial ornamentation really consists of basal and apical yellow spots jointed by a red stripe, the stripe being absent on the hind tibiae; abdominal markings shining, orange-yellow, the band on the first segment divided into four spots, on the second almost divided, on the others successively somewhat less so, but all divided in the middle; sixth segment with two very large yellow marks; lateral apical lobes marked with yellow, moderately broad; ventral surface of abdomen black, except sides of first segment, which are ferruginous.

Hab.—Two collected by Dr. Davidson; the type from Palm Spring; the other (reddened by cyanide), Los Angeles. Easily known by the apricot-colored tegulae, the orange-yellow markings of abdomen, &c. The end of the abdomen is constructed in the manner of **A. cognatum,** but the lateral lobes are a little broader and somewhat divergent, and the lateral spines of the sixth segment are practically straight.

Anthidium palliventre, Cresson.

With some hesitation I refer here four males, one from Logan, Utah (L. Bruner, No. 17), the other three collected by Dr. Davidson in California, at Los Angeles, Tehachapi and Bear Valley. **A. palliventre** was described from a female collected in California, and females of this group have few distinctive characters. A female collected by Dr. Davidson at Los Angeles seems to be **palliventre,** but the ventral scopa is blackish in the middle and white laterally. It has the face entirely black.

Catalogue of Indian Relics on Santa Catalina, etc. Cont.

BY MRS. M. BURTON WILLIAMSON

No.	
13,126.	Bone Dagger.
13,127.	Fragment of handle to 13,126.
13,128.	Bone implement with hole.
13.129.	Bone needles—3.
13,130.	Bone needle, long.
13,131.	Bone Awls, small—4.
13,132.	Vertebra of fish.
13,133.	Fragments of baskets.
13,134.	Fragments of baskets, wound.
13,135.	Strings, one wound in ball.
13,136.	Fragments of cloth.
13,137.	Red paint, powdered and in lumps.
13,138.	Red paint, in worked shapes—5.
13,139.	Black paint, powdered.
13,140.	Shells with paint in them.

13,141. Fish vertebrae, paint in them.
13,142. Small stones for grinding paint.
13,143. Small steatite pot, ornamented with lines.
13,144-46. Small pot, steatite, plain.
13,147. Small ladle, steatite (toy).
13,148. Pipe of steatite, bone mouth piece.
13,149. Stone pipe, with bone mouth piece.
13,150. Stone pipe ,broken, with bone mouth piece—2.
13,151. Stone pipe, without mouth piece.
13,152. Fragments stone rings--2.
13,153. Perforated stone ornaments—5.
13,154. Stone ornament.
13,155. Perforated stone, weight for digging.
13,156. Perforated stones, weights, for digging—6.
13,157. Stone beads—3.
13,158. Stone implements—2.
13,159-64. Comali for cooking tortillas.
13,165. Comali, with 3 holes.
13,166. Comali, with band.
13,167. Comali, with lines.
13,168. Stone implement, grinding shells?
13,169. Stone pestle.
13,170. Stone implement.
13,171. F. dagger.
13,172. Spearpoint, triangular, obsidian.
13,173. Arrowhead.
13,174. Spearpoint, obsidian, leaf-shaped.
13,175-78. Shell beads—2.
13,179. Shells. Abalone—3.
13,180-84. Shell ornaments, broken—3.
13,185. Shell fishhooks, different stages of manufacture—11.
13,186. Stone implements used in cutting 13,185—12.
13,187. Stone implements used in cutting 13,185, broken—6.
13,188. Hair brushes.
13,189. Copper cup, containing cloth, basket, string of beads and part of human scalp.
13,192. Copper plate, covered with cloth and containing vegetable products—seeds.
13,193. Copper cup, covered with cloth and skin.
13,194. Copper bowl, containing cloth and human hair.
13,195. Copper bowl.
13,196. Copper jar.
13,197. Implements and ornaments of copper.
13,198. Broken spoons.
13,199. Bell.
13,200. Sleigh bell.
13,201. Bell clapper, copper.

13,202. Vase.
13,203. Three fibulae tied together.
13,204. Fibulae. Buckle, copper.
13,205. Bosses, ornamented with shell.
13,206. Medals of Catholic Church—3.
13,207. Thimbles; worn as beads.
13,208. Copper implement.
13,209. Buttons, strung together.
13,210. Buttons and beads strung together.
13,211. Copper awl.
13,212. Strings of glass and shell beads.
13,213. Brass rings and beads on strings.
13,214. Glass and part of ring (for making fire).
13,215. Earthen bowl made on wheel.
13,216. China bowl, crackled ware.
13,217. Leather band.
13,218. Glass beads.
13,219. Beads.
13,220. Cigarette holder.
13,221. Iron hoe.
13,222. Iron axes—4.
13,223. Iron cannon balls—2.
13,224. Iron swords.
13,225. Iron scissors.
13,226. Iron spear point.
13,227. Iron knife blades.
13,228. Fragments gun barrels?
13,229. Iron buckles, implements, etc.
13,230. Iron bowl, small, broken.
13,231-45. Skull and bones—human.
13,246-59. Human crania.
13,260. Human Cranium and bones.
13,261. Diseased bones.
13,262. Pelvis, belonging with 13,260.
13,263. Fragment of cloth.

Cabrillo's Rancheria.

13,264. Copper band, with cloth inclosed.
13,265. Copper buckle.
13,266. Copper implements—2.
13,267. Iron ladle.
13,268. Iron implements, broken—2.
13,269. Stone ornament, perforated.

Graves, Johnson's Place, Santa Catalina, Cal.

13,270. Boat-shaped dish of steatite.
13,271. Whale of steatite. Toy.
13,272. Whale of steatite. Toy.
13,273. Perforated stone. Weight.

13,274. Sinker?
13,275. Sharpening stone.
13,276. Stone.
13,277. Stone worked.
13,278. Wooden implement.
13,279. Bone awl.
13,280. Shell fishhooks in process of manufacture.
13,281. Shell ornaments.
13,282. Shell beads.
13,283. Glass beads.
13,284. Red paint.
13,285. Bones of child.
13,286. Human skull and bones.
13,287. Human skull and bones.

Graves, Whitney's Place, Santa Catalina, Cal.

13,288. Stone arrow straightener.
13,289. Comalis for cooking tortillas.
13,290. Stone pipe.
13,291. Grooved stone.
13,292. Stone dipper.
13,293. Stone ring-weight for digging.
13,294. Stone chips.
13,295. Worked stone sinker?
13,296. Shells of abalone.
13,297. Shells of abalone, with red paint.
13,298. Cone of red paint.
13,299. Shell fishhooks in process of manufacture.
13,300. Shell ornament, sabre shaped.
13,301. Shell ornaments—8.
13,302. Bone implements.
13,303. Claws.
13,304. Shell implements.

Workshop, Frank Whitney's Place, Santa Catalina Cal.

13,305. Shell of Abalone, with seed.
13,306. Fishhooks, shell, in process of manufacture.
13,307. Shell ornaments.
13,308. Fish vertebrae.
13,309. Skull of crow.
13,310. Asphalt.

Shell Mound, F. Whitney's Place, Santa Catalina, Cal.

13,311-15. Soapstone pot, rude.
13,316. Soapstone pot, ornamented with lines.
13,317-27. Small pot of steatite.
13,328-31. Small stone pot.
13,332-34. Steatite pot, with groove on bottom.
13,335-39. Comali, with groove on bottom.
13,340-42. Perforated Comali, steatite.

(Continued in May Number.)

Transactions for March, 1904.

ASTRONOMICAL SECTION.

The meeting was presided over by Chairman W. H. Knight, who introduced the exercises of the evening by a statement of current astronomical phenomena, giving an account of the observations made at the Lick Observatory on the motions and peculiarities of Borelli's comet, laying special emphasis upon the remarkable characteristics of the several tails of the comet. Mr. Knight also read an account of the appearance and movement of three remarkable meteors observed on the Pacific by the commander of the United States Steamship Supply. The variations in the apparent motion of these meteors cannot be accounted for by any known theories of meteoric motion.

The chairman read an extract comparing all the time that is supposed to have elapsed since the earth became a solid to a day of twenty-four hours, showing by comparative subdivisions of the two periods, that the six thousand years of the recorded history of man is represented by the last five seconds of the day that stands for the aeons of the earth's existence.

Mathematics being the major topic of the evening, the chairman read some interesting extracts from famous mathematicians relative to the beauty and practical value of mathematical principles.

Mr. B. R. Baumgardt was then introduced and presented the subject of logarithms, explaining the principles upon which the system is based and the stupendous saving of time and labor due to the use of logarithms in all calculations involving large numbers and numerous or long multiplications and divisions.

Mr. Baumgardt then exemplified the principle of the conchoid curve, which gave rise to a discussion of the cycloid curve and its application to a theoretically accurate pendulum.

The meeting was concluded with the reading by Mr. Baumgardt of a graphic account of the partial solar eclipse of May, 1900, as witnessed from Mount Lowe by the members and friends of the Astronomical Section.

MELVILLE DOZIER, Secretary.

March 21, 1904.

GEOLOGICAL SECTION.

Los Angeles, Cal., March 28, 1904.

The officers of the Geological Section met at the Woman' Club Rooms, but owing to the inclemency of the weather the attendance was small and the meeting adjourned to April 25th, when the Rev. H. B. Gage, of Long Beach, will deliver a lecture on the "Minerals of Riverside County," and the secretary will exhibit specimens of the crystallization of iron and copper.

G. MAJOR TABER, Secretary.

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MELVILLE DOZIER G. W. PARSONS

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A Preliminary Synopsis of the Southern California Cyperaceae.

BY S. B. PARISH.

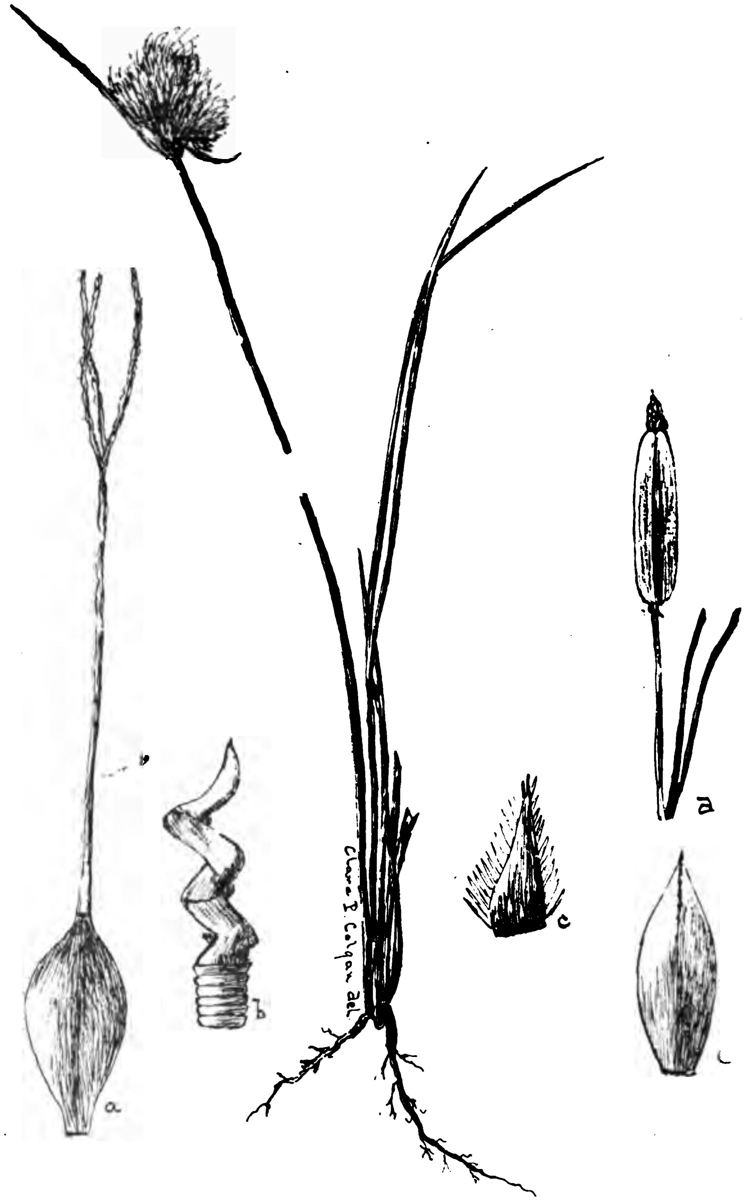
2. *SCHOENUS, Linn. Gen. n. 65, in part.*

Herbs, mostly perennial, varying in habit. Inflorescence capitate, or variously spicate, or paniculate. Flowers in flattened spikelets of few scales, rarely only one. Scales 2-ranked, 1-8 of the lowest empty and contiguous. Rachis of the fertile flowers prolonged and flexuous, or in the 1-flowered species produced beyond the flower, curved and bearing an empty scale. Perianth of 6, or fewer, bristles, which are often ciliate, sometimes scale-like, or wanting. Stamens 3, rarely fewer, or 4-6. Style 3-cleft, little or not at all enlarged at base, wholly deciduous from the summit of the 3-angled, or 3-ribbed achene.

A genus of some 60 species, mostly natives of Australia or New Zealand. Represented in America only by the following species, which is also European.

1. **Schoenus nigricans,** Linn. Sp. Pl. 43.

Culms erect, terete and striate, 5-6 dm. tall; leaves shorter, narrowly linear, stiff and erect, their dark purple or blackish bases enlarged and clasping; involucral leaves 2, similar, the lower erect and 6-12 cm. long, the upper very short or a little exceeding the head; spikelets numerous, aggregated in a dense head, 5-15 mm. long; the flexuous upper part of the rachis



SCHOENUS NIGRICANS, Linn.

Plate 5. Plant collected at Arrowhead Hot Springs x ¼.

a. Pistil x 10.
b. Rachis x 5.
c. Perianth Scale x 20.
d. Stamens x 10
e. Scale x 5.

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readily separating from the lower straight part; scales dark reddish brown, strongly folded, 5-8 mm. long, deciduous, the lower infertile scales 6-8, smooth and acute, the fertile 4-6, often scabrid on the keel and mucronulate, the uppermost often staminate, or empty; perianth scales 2-5, accuminate, or aristate, ciliate toothed, 0.5mm. long, persistent; anthers tipped with a conical cellular appendage; style dark, about 1 cm. long; achenes white, smooth and shining, ovoid, obtusely 3-angled, 1.5 mm. long.

Arrowhead Hot Springs, near San Bernardino, and Lone Pine Canyon, near Cajon Pass; Parish. Furnace Creek Canyon, Death Valley; Coville and Funston. The species is known in America, in addition to the above stations, only from Ash Meadows, Nevada, and from Florida. All the western plants grow in alkaline soil. Plate V.

3 ELEOCHARIS, R. Br. Prodr Fl. Nov. Holl. 1:224.

Annual or perennial herbs with tufted, angular, flattened, or terete culms. Leaves reduced to basal sheaths, the lowest rarely bearing a short blade. Flowers in solitary, erect, non-involucrate spikelets. Scales concave, scarious-margined, spirally imbricated around the rachis. Perianth of 1-12 retrorsely barbed bristles, or rarely none. Style 2-cleft and the achene lenticular, or 3-cleft and the achene 3-angled or turgid, its conical or flattened tubercular base persistent on the summit of the achene.

A genus of about 100 species, growing in wet places, from the tropics north to the Arctic regions.

Key to the Species.

Style 2-cleft; achene lenticular.
Annual; achene black, tubercle flat. **1. E. capitata.**
Perennial; tubercle conical. **2. E. palustris.**
Style 3-cleft, achene 3-angled or turgid.
Achene cancellate; tubercle conical. **3. E. acicularis.**
Achene puncticulate; tubercle disc-like **4 E. disciformis.**
Achene smooth and shining.
Tubercle not continuous with the achene.
Tubercle broader at base than the apex of the achene; spikelet oblong. **5. E. montana.**
Tubercle calyptrate; spikelet lanceolate **6 E. Parishii.**
Tubercle continuous with achene; conical. **7 E. rostellata.**

**Styles 2-cleft and achenes lenticular; tubercle constricted at base.*

1. Eleocharis capitata, R. Br. Prodr. Fl. Holl. 1:225.

Annual, culms slender or filiform, terete, erect, 1-1.5 dm. tall; upper sheath 1-toothed; spikelets ovoid, obtuse 4-5 mm.

high and 3 mm. thick; scales ovate, obtuse, about 2 mm. long, brown with a green midvein; stamens 2; bristles 4-6, obscurely toothed, equalling the achene, or none; achenes broadly obovoid 0.75 mm. high, black and shining, tubercle flat and disk-like.

In wet sand San Bernardino; 1293, 5276, 5277 Parish. Palm Springs in the Colorado Desert; 1160 Parish. A species of wide distribution in tropical regions.

2. **Eleocharis palustris,** R. & S. Syst. 2:151.

Perennial by horizontal rootstocks; culms stout, terete, striate, 3-15 dm. tall; basal sheaths brown, the uppermost very obliquly truncate; spikelets ovoid-cylindrical, acute 1 cm. long; scales ovate, obtuse or subacute, purple-brown, with green midvein; stamens 2-3; bristles 4, equalling the achene, or none; achenes ovoid-oblong, 2 mm. long, yellow-brown, smooth and shining, tubercle triangular-conic, less than one-fourth as long as the achene.

Probably common in wet places in the Cismontane region, but the only specimen seen was collected by myself, at San Bernardino. Cosmopolitan.

Eleocharis palustris glaucescens, Gray, Man. ed.5, 558. Britt. & Br. Ill. Fl. 1:252.

Culms slender, 3-5 dm. tall; spikelets oblong, 5-10 mm. long, acute; upper sheaths horizontally truncate; tubercle narrower and more acute.

In swamps and ditches and along streams; probably common. Lake Surprise, 8,200 ft. alt., San Jacinto Mts.; 2489 Hall. San Bernardino Valley; 1185 Parish. Common throughout North America.

***Styles 3-cleft; stamens usually 3; plants perennial by horizontal rootstocks except n. 4.*

+-*Uppermost sheaths 1-toothed, with a more or less indurated ring at the horizontally truncate summit; tubercle not continuous with the summit of the obscurely 3-angled, turgid, achene.*

++*Achenes having intermediate ribs and minute transverse ridges*

3. **Eleocharis acicularis,** R. & S. Syst. 2:154.

Culms tufted from filiform rootstocks, setaceous or filiform, 3-15 cm. tall; spikelet narrowly oblong, or ovate, acute, 2-3 mm. long, acute, 3-9-flowered; scales ovate-oblong, acutish, 1 mm. long, pallid or greenish; bristles 3-4, weak, exceeding the achene, often none; achenes pale, oblong-ovoid, 1 mm. long; tubercle conic, one-fourth the length of the achene.

Banks of the Santa Ana river, near San Bernardino; 1061 Parish. An immature specimen collected at Los Angeles, by Davidson, may belong here. Throughout North America.

(To be continued.)

Descriptions of Some Undescribed Fossil Shells of Pleistocene and Pliocene Formations of the Santa Monica Range.

BY PROF. J. J. RIVERS.

Dr. Ralph Arnold in his memoir of the fossils of San Pedro published in June, 1903, made no mention of the species now described. His very excellent treatise scarcely touched upon the riches of the Santa Monica Range though he almost exhausted the gifts of nature in fossil Mollusca of San Pedro together with those yielded by the rocks of San Diego and Santa Barbara.

The Santa Monica Range has the same deposits as those of San Diego, San Pedro and Santa Barbara judging from the fauna found in this range. The San Diego Pliocene is represented here by co-types of the following species:

Ostrea veatchi Gabb., Pecten expansus Dall., Pecten hastatus Sow., Pecten bellus Con., Pecten caurinus Gld , Pecten hemphilli Dall., Pecten stearnsii Dall., Pecten opuntia Dall., Pecten subventricosus Dall., Pecten ventricosus Sow., Pecten hericeus, Gld., Pecten subnodosus Dall and several other Pectens together with Opalia varicostata Stearns and Pisania fortis Carp.

The formations of Santa Barbara, San Pedro and San Diego have each yielded **Brachiopods,** but the middle **Pliocene** deposits of the Santa Monica Range have furnished all the known species found hitherto discovered in the other three localities, viz: **Terebratalia smithi** Arnold. **Terebratalia hemphilli,** Dall., **Laqueus jeffreysi** Dall., **Laqueus californicus Koch.**

Santa Monica Range furnishes a wide field of geological investigation being rich in Pliocene deposits. There appears to be three distinct Pliocene epochs; the oldest is a thick deposit with few fossils and its matrix is formed out of the first erosion of the Miocene and contains chunks of the shale uneroded and fossils not yet identified. The strata has been tilted to the perpendicular and crushed and crossbedded so that when the fossils are disturbed they do not crumble but break to pieces.

The next older strata are the representatives of the San Diego hard sandstone series yielding the Pectens. The later Pliocene is the same as represented on Deadman's Island, San Pedro. These are capped everywhere by Quaternary beach gravels and by erosion debris as well as by glacial drift. The canons of the coast yields glacial pebbles not profusely but commonly and a student in geology can identify them easily.

Hyalaea tricuspida n. sp.

Shell opaque white; dorsal plate widely convex; smooth on the disc; a lateral spine on either side and a terminal appendage short and truncate behind; parallel to the lateral spines is a carina; on the disc of the other side are five longitudinally situated carinae; aperture sharply truncate on dorsum, but strongly rounded on the opposite plate; the slit reaching quite to the lateral spines.

Dimensions: Longitude ,8 mm., latitude 7 mm.

Geology: Pleistocene of Santa Monica Range, Cal.

Eulima raymondi n. sp.

Form: Very attenuate; shell in texture as usual in this genus smooth, glossy, and white in color; whorls eleven; sutures scarcely impressed; strongly oblique; the three last whorls equal to the remainder; aperture 2.2 mm. long and 1 mm. wide. Longitude 11 mm., latitude 2 mm.

Not known to be living.

Geology: Pleistocene Santa Monica Range, Cal.

This cannot be confounded with any of the described species belonging to this coast it being much more attenuated in form comparing length with width, the mouth more produced forward and elongated and narrowed behind. Eleven specimens have been secured and are true to form and proportions.

Chrysodomus arnoldi n. sp.

Shell thick, robust, chalk white; elegantly, fusiform; spire about one-fifth of the whole; spire compressed; whorls about five; nucleus and following whorl missing; the third and fourth whorls are sculptured with rather wide transverse ridges; but the fifth whorl the ridges are nearly obsolete; sutures roughly encrusted; body whorl strongly shouldered but not tabled; the sculpture consists of five woolving, flattened strive or ridges crossed at intervals by strong incremental lines which perhaps in an unworn example might show varices; in the fossil there appears faintly a cancellate pattern; all the whorls bear an alternate series of fine revolving ridges which on the body whorl gages two to a mm.; columnella medium, twisted; channel open but shallow; incrusted thickly interiverity; aperture pyriform umbilicus subperforate as in **Pisania fortis** Carpt.

Dimensions: Long 40 mm.; lat. 20 mm.

Geological formation, Pliocene. One specimen.

Locality: Crawfish Gorge's; San Pedro, Cal.

Chrysodomus merriami n. sp.

Shell bucciniform; whorls eight; nucleus eroded; incremental and fine lines appear as soon as growth begins which increase in regular ratio until the body whorl show ridges and appressed lines that gage six to a mm. Apex not depressed as it gages 20 mm.; the whorls are strongly rounded; sutures deeply impressed; bodywhorl 25 mm. long, much inflated; outer lip not thickened but has a bulging inflation turning inwards; the edge being entire. The columnella being hid in the matrix but from several fragmentary examples; the columnella is short, twisted; channel wide; aperture very wide.

This shell was found in the same deposit as **C. aphelus** Dall and C. **griseus** Dall.

Geological formation: Pliocenl; Santa Monica Range.

Chrysodomus aphelus Dall.

The U. S. Report on Albatross Mollusca Pro. U. S. Nat. Mus. Vol. XII pages 219-362, gives descriptions by Dr. Healy Dall of various living Mollusks dredged from near Santa Barbara, Cal.

An examination of the Pliocene strata of the Santa Monica Range has brought to light two of Dr. Dalls species and a third one in the same deposit that the dredge of the Albatross did not discover.

"The living shells, (according to the Albatross Reports) occur in 414 fathoms grey sand." The fossils occur in a silty formation in which remains of marine and terrestrial flora abound. The elevation from sea level of these strata varies from a few feet up to seventy or a hundred feet above. The height or depth of these strata carries no geological value but it is their position and what they contain that yield their natural worth; these strata dip strongly to the southwest at various angles and in places tilted to the perpendicular. These fossils therefore may have enjoyed at one time a depth of 414 fathoms, particularly so as the deposits dip under a hundred feet of nearly horizontal Pleistocene.

Chrysodomus aphelus Dall. (Albatross Mollusca Pl. VI. fig. 7.)

Shell bucciniform; six whorled, smooth; nucleus eroded; whorls full, well rounded; sutures distinct and somewhat deep; sculptum of faint incremental lines which curve to the swelling of the whorls; obscure spiral traces; outer lip thin, smooth, polished white, on the inside, which is reflected rather strongly at the upper angle but diminishes gradually towards the channel; columnella short, not calloused, throat smooth white; pillar very obliquely truncate.

Dimensions: Report gives maximum longitude 32 mm.; maximum latitude 18 mm.; but the fossils give increased dimensions; the maximum being 40 mm. to 20 respectively. The majority of the fossil forms are however much below these measurements.

Chrysodomus griseus Dall.

This is another of the "Albatross Mollusca" and Dr. Dall's description can easily be followed with the shell before me.

Shell thin, rather acutely pointed when perfect;" seven or eight whorled; the substratum, pillar, throat milk white and smooth; nucleus eroded, small round; suture distinct; whorls full and rounded; **transverse sculpture twenty or more arcuated wave-like ribs,** which on the earlier whorls often reach from suture to suture but are strongest on the periphery. As the shells do not hold to the same relative proportions of latitude and longitude, the more elongate the specimen the fainter is the sculpture.

Found in company with **B. aphelus** Dall in the Pliocene of Santa Monica Range, Los Angeles Co., Cal.

One specimen perfect, two nearly so and several more or less fragmental.

The Bees of Southern California. IV.

BY T. D. A. COCKERELL.

Anthidium saxorum, n. sp.

Male; length about 11 mm.; pubescence white, faintly tinged with ochreous dorsally, abundant on head and thorax, but not concealing clypeus; clypeus, lateral face-marks, mandibles except tips, stripe on scape, and small spot above each eye, pale chrome yellow; mandibles with only one large tooth; flagellum black; thorax all black except tubercles and two marks on scutellum, which are yellow; tegulae with a large yellow spot in front, and a small one behind; wings fairly clear; femora black, with a small apical yellow spot on the middle and hind ones; tibiae with a broad yellow stripe on the outer side, which sends a process to the anterior side apically; basal joint of tarsi yellow; abdomen unusually smooth and shining, the bands deep orange; band on first segment broken into four spots, those in the middle small and transversely elongated; bands on second to fifth emarginate medially and laterally, but not broken; sixth nearly all orange; seventh with only two yellow spots; lateral apical lobes broad and not much produced, very much as in **A. mormonum,** except that they are less curved inward; venter reddish-black.

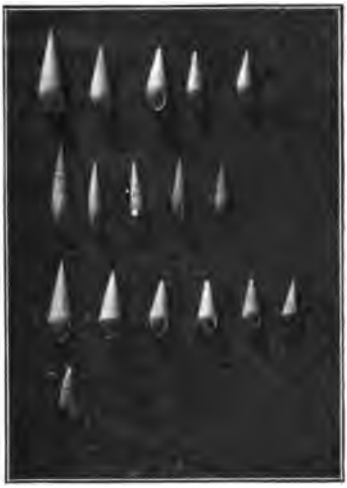
Hab.—Rock Creek, California, one collected by Dr. Davidson. By the cariniform tubercles, white pubesence, etc., this resembles **A. mormonum,** but it differs by having no basal spots on scutellum, bands on abdomen not interrupted medially, &c.

JUL 19 1904

Fossil Shells of the Santa Monica Range.

BY PROF. J. J. RIVERS.

(See Page 69.)



No. 1. Eulima micans, (Carpenter).
No. 2. Eulima ramondi, (Rivers).
No. 3. Eulima hastata, (Sowerby).
No. 4. Eulima falcata, (Carpenter).

Errata.

Line 30, page 70, ought to read: "the sculpture consists of fine revolving flattened striae.

Line 37, page 70: For "interiverity" read interiorly.

Anthidium collectum, Huard:

Four males obtained by Dr. Davidson are referred here; two from Los Angeles, one from Tehachapi, one from Switzer's. According to the original description, **collectum** Huard (**compactum,** Provancher) differs from **tricuspidum** in being smaller, having no marks on thorax, and the first three segments of abdomen with the bands divided into spots. The last character is somewhat variable. The species appears to be very near to **A. emarginatum,** Say, but that has the abdominal bands yellowish-white or white. The specimen from Tehachapi represents a distinct variety, perhaps species, which may be described thus:

A. collectum var. ultrapictum, nov.

A little larger; scape with a yellow stripe; abdominal bands very bright yellow, only that on first segment divided into four spots, the others not even divided in the middle, though emarginate there and squarely notched laterally; sixth segment with two very large round yellow marks, touching in the middle line; seventh all black, with the lateral lobes not so produced as in **collectum,** and distinctly angled on the outer side; tibiae with more yellow. The dorsal pubescence has just a faint ochreous tint. There are no sub-apical ventral spines.

Anthidium (emarginatum, Say var?) Titusi, nov.

Easily distinguished from typical **emarginatum** (male) by the bright lemon-yellow (instead of yellowish-white or white) abominal bands, and the tibiae all black except a minute basal spot, and an apical one on middle tibia. Clypeus with two black dots near upper border; antennae entirely black; dorsal pubescence dull white; thorax all black except two short lines on scutellum; anterior part of tegulae yellow; wings dusky; basal joint of tarsi light yellow, the other joint ferruginous; first abdominal segment with very long hair, its band divided into four spots, the middle ones transversely elongated; bands on the second and third greatly narrowed mesad of the notch, and slightly divided in the middle; on fourth and fifth widely notched, but only emarginate in the middle; sixth segment with two very large comma-shaped yellow marks; seventh all black, formed about as in **ultrapictum,** but the lateral lobes not quite so produced; venter black; apex of venter strongly tridentate, with a large median ferruginous process directed caudad, and large black lateral spines directed more downwards.

Hab.—Fort Collins, Colorado, June 13, 1900. (E. S. G. Titus.) The apical ventral structures recall **A. montivagum.**

Anthidium pecosense, n. sp.

Male; length about 11 mm., stout and compact; pubescence white on pleura, cheeks and face below antennae, but fulvous on upper part of head and thorax; hair quite dense over clypeus; clypeus, lateral face-marks, mandibles except tips, and small spots above eyes, lemon yellow; clypeus with two dusky dots near its upper margin; mandibles comparatively narrow, second tooth small but pointed; antennae entirely black; thorax black with the tubercles, a bent stripe on antero-lateral corner of mesothorax, and two lines on scutellum, yellow; tegulae black with a large pale yellow mark; wings dusky; femora black, with more or less of a yellow stripe beneath (best developed on the anterior ones, but obscured by hair), and the middle and posterior ones with very small apical (knee) spots; tibiae broadly yellow on the outer side; basal joint of tarsi yellow, the other joints ferruginous; abdomen with the bands bright lemon-yellow, that on the first divided into four spots, the median spots subquadrate; band on second divided in the middle and squarely notched laterally, on third divided in middle and with small lateral notches, on fourth and fifth emarginate only in the middle, and not notched laterally; sixth almost all yellow, but emarginate with black in middle; apical segment with two yellow spots; lateral apical lobes broad, median process long, lateral teeth on sixth segment rather short; venter black.

Hab.—Pecos, New Mexico, one at flowers of **Heracleum lanatum,** June 21, 1903. (Cockerell). The apex of the abdomen is of the same type as **A. mormonum,** from which it is easily distinguished by the fulvous hair of head and thorax. From **A. poudreum,** Titus (misprinted **pondreum** in original description). **A. pecosense** differs by having the ventral segments of abdomen thickly pubescent right across, femora and tibiae with white hair, dorsum of thorax with abundant fulvous hair, no dots before the lines on scutellum, all the femora with yellow stripes, band on first abdominal segment broken into spots.

Anthidium bernardinum, n. sp.

Male; length about 13 mm., general appearance of **A. tricuspidum,** but differing in many details, and especially in the apex of the abdomen, the lobes of which are much shorter, broader and more rounded, and yellow with dark brown margins, the median spine also being dark brown. The real affinity of the insect is with **A. pecosense,** but it is larger, and very different in its deep orange markings;

the dorsal pubescence of the head and thorax, as in **pecosense,** is fulvous. Head marked as in **pecosense,** except that the scape has a yellow stripe (sometimes wanting) and the spots above the eyes are produced and pointed mesad; thorax with the yellow markings of **pecosense** replaced by orange and more developed, forming a broad band surrounding the mesthorax and scutellum, except for a space in front; band on first abdominal segment notched behind, or sometimes divided into four spots, in which case the median spots are quadrate and qute large; remaining bands laterally notched (not very broadly) in front, and emarginate in the middle, those on the second, third and sixth frequently divided; lateral spines of sixth segment partly yellow; venter of abdomen ferruginous, with yellow spots at extreme sides; apical ventral segment tridentate, the middle tooth broad, ferruginous, and emarginate, the lateral ones rather broad and not very long, ferruginous edged with black. The femora have broad orange stripes, the tibiae are entirely orange on the outer side; basal joint of tarsi orange, the others ferruginous.

Hab.—Five males collected by Dr. Davidson; type from Strawberry Valley, others from Mt. Wilson. With these I associate some females from Bear Valley, Wilson's Peak and Los Angeles. They are similar to the male, but smaller (10½ mm. lon|g), the clypeus has a blackish median shade, the spots above the eyes are produced into bands which nearly meet in the middle line, and the ventral scopa is white. The female suggests **A. placitum,** but the abdomen is strongly punctured, and not transversely impressed at base.

The following three forms are referred as varieties to **A. bernardinum,** but they certainly look very different, though similar in the details of the markings, &c.

A. bernardinum v. **wilsoni,** n. v.

Male; length about 10½ mm.; dorsal pubescence pale fulvous; antennae entirely black; band on fourth abdominal segment divided in middle, as well as those on second and third; apical lobes with the inner angle more prominent; yellow on thorax reduced to two lines on mesothorax in front, line on tubercles, and two lines and two dots on scutellum; venter of abdomen very dark brown; apical ventral segment with the median process large, broadly rounded, dark brown, not emarginate, the lateral ones pointed black teeth; femora brown-black, the middle ones with a yellow apical spot, the hind ones with an apical stripe.

Hab.—Mt. Wilson, California, one collected by Dr. Davidson.

Anthidium bernardinum v. **fragariellum,** n. v.

Male; length 9½ mm.; dorsal pubescence white; antennae entirely black; spots above eyes oval, not pointed mesad; marginal yellow of mesothorax and scutellum rather well developed; wings decidedly reddish; middle and anterior femora with broad yellow stripes beneath, hind femora with the apical half striped above and beneath, middle femora with a yellow apical patch above, but anterior femora all black above; apical lobes of abdomen more curved inwards than in **bernardinum**; venter of abdomen brown black; last ventral segment with median process ferruginous, broad and subtruncate, not emarginate, the lateral processes pointed black spines.

Hab.—Strawberry Valley, California, collected by Dr. Davidson. A female from the same place appears to belong here; it has two cuneiform black marks on the clypeus; femora black, the anterior and middle ones with a yellow apical mark behind; scopa white. It is of the same size as the male.

Anthidium bernardinum v. **aridum,** n. v.

Male; like v. **fragariellum,** but a little larger; scape yellow in front; face less hairy; axillar spots absent; only the first abdominal band interrupted in the middle (the second and third are interrupted in **fragariellum**); yellow stripe on middle femora not extending beyond apical half; lateral apical lobes of abdomen more triangular, less rounded; venter black.

Hab.—Rock Creek, California, collected by Dr. Davidson.

I rather expect that when more is known about these insects **wilsoni** and **fragariellum** will stand as valid species, and **aridum** as a variation of the latter.

Flora of San Clemente Island.

BY BLANCHE TRASK.

I.

For many years San Clemente has lifted its amethystine heights, as I have followed the trails of Santa Catalina Island; a day's trip to the "West End" and a week's camping at the "East End," with a long tramp over the crest-line, made me doubt the common assertion that "San Clemente is only a treeless waste of sand."

Visits to the more northern of the Channel Islands—Santa Cruz, Santa Rosa, San Miguel and the little Anacapas—claimed my attention; and a three months' sojourn at San Nicolas

Island, at three different seasons with a tarrying at tiny Santa Barbara Island and one special trip there, absorbed all my leisure; while the heights of San Clemente ever upheld their deeps, unknown to me! So near—and yet I knew them not!

However, last year, after living there three months, I have a real satisfaction in thinking I know something of that Island. When I left I felt I would never again care to see places so terrible; but I find my heart following my eyes from the dear old Catalina trails as I see San Clemente this winter lying in all its amethystine beauty, like an Indian arrow-head, tipped with shining stretches of sand, enshrined by the white arms of the sea.

Eighteen miles long and nearly 2000 feet elevation upon its greatest height, it is by far the most inaccessible of all the Channel Islands.

A rolling upland strewn with jagged volcanic rocks, which cut the boots at every step, reaches its greatest altitude on the north coast—a coast gashed by precipitous and bold gorges, not one of which could properly be called a canyon.

The south coast rises from the sea with perpendicular walls fifty to three hundred feet high, where it surprises you by a flat which may be followed the entire length of the south coast, over a trail the worst of all the trails which I have followed in many thousand miles' tramping on these Channel Islands in the last ten years. It winds and turns and breaks into "cuts" and never a moment is the foot on level ground, but constantly caught in the crevices of the gnawing lava rocks, while a glimmering heat waves under the eaves of the heights, from whence great arroyos leap to the river flat below, casting rivers of fresh rock upon the already over-burdened rim; between these arroyos terraces rise in endless succession.

You walk there in October and November and the aridity is oppressive; but in May the same trail is a miracle of color. Eschscholtzia ramosa starring the way, while Gilia Nevinii, whose heart is the true turquoise, so that I called it "The Turquoise Daisy," is so plentiful that the arms could be filled with it. Senecio Lyoni is nearly as common as everywhere, one to three feet tall.

The sweet "Lava Daisy"—Malcothrix foliosa Greene—is here in its own home and special joy of existence. You marvel that it can draw its life from rocks which are hot to the hand and which even burn the feet in walking.

On the north coast from the highest line the gorges leap into the sea below, five hundred to two thousand feet, so suddenly, and often so unexpectedly, that no man can follow such ways in safety; there are rims of beaches below which can be looked into directly from the greatest heights; at high tide, they are well-nigh covered with surf, for much of the time either a north or a west or a "nor-west wind" is sweeping wildly down the whole length of the island, stirring the waves to a foam without warning.

At the east end are long stretches of sandy beaches and low outlying points; at the west end are some two miles of dunes and the principal Indian rancherias.

There are two springs of water on the north coast and two on the south coast of San Clemente. At "Gallagher's"—the west end—an old ranch-house is situated where rain water is caught in tanks for all purposes. There is an artesian well at the east end; at the middle of the south coast is a pumping plant for a brackish spring. Two shepherds are regularly retained upon the island by the San Clemente Wool Company, who have leased this land from the United States Government.

I am indebted to the courtesy of the San Clemente Wool Company for granting me a pass to all parts of the island, with camping privileges; and I pledged myself that not a sheep should suffer through my hand or that of my people.

(Continued in June Number).

PUBLICATIONS RECEIVED.

"Notes on the Angora Goat." Bulletin No. 98. Maine Agricult. Exper. Station.

"Studies on the Ecology, Morphology and Speciology of the Young of Some Enteropneusta of Western North America," by Wm. E. Ritter and B. M. Davis. No. 5, Vol. 1. Zoology. University of California Publications.

"Adulterated Drugs and Chemicals." U. S. Dept. Agricult. Bureau of Chemistry. Bulletin No. 80.

"Contributions from the Gray Herbarium," by B. L. Robinson. No. 27.

"The Pliocene and Quaternary Canidae of the Great Valley of California," by J. C. Merriam. University of Cal. Geology Dept. Vol. 3, No. 14.

"A Revision of American Siphonaptera, or Fleas, together with a complete list and Bibliography of the Group," by Carl F. Baker. U. S. National Museum. No. 1361.

"Muhlenbergia," Vol. 1, No. 4.

"Experiment Station" Record No. 6. Vol. 15 U. S. Dept. Agricult.

"Thirty-fourth Annual Report of the Entomological Society of Ontario, 1-03." Ontario Dept. Agricult.

"Desert Botanical Laboratory of the Carnegie Institute." Carnegie Institution, Washington.

RECENT PUBLICATIONS.

The Missouri Botanical Garden has recently distributed an elaborate Synopsis of the Genus Lonicera, by Alfred Rehder. The number of species recognized is 157, and, in addition, a large number of varieties, forms and hybrids are noticed. The genus has its largest development in Central and Eastern Asia. The North American continent has but twenty species, and Europe but eighteen. The species and varieties of our own region, as recognized by the author, may be recognized by the following key:

Leaves all distinct, petioled, never stipulate; corollas yellow, pubescent.
  Leaves grayish tomentose beneath. **L. subspicata.**
  Leaves glabrous. **L. subspicata denudata.**
At least the uppermost pair of leaves connate.
  Leaves never stipulate; corollas yellow, glabrous. **L. interrupta.**
  Middle leaves stipulate; corolla pink.
  Flower whorls few, slender peduncled. **L. hispidula.**
  Whorls many, in elongated spikes. **L. hispidula Californica.**

The first of these plants is common throughout the cismontane region, but its variety is confined to the coastal sub-region. **L. interrupta** is a more northern species, but has been collected at Acton by Hasse. **L. hispidula** is also more northern in its range, and its variety is apparently confined in our region, to Santa Catalina Island. S. B. P.

Among "Publications Received" our readers will note two original works by local scientists. Prof. B. M. Davis in conjunction with Prof. Ritter has issued a volume of "Studies on the Ecology, &c., of the Enteropneusta," while Prof. C. F. Baker, of Pomona, has, through the U. S. National Museum, issued a valuable work on the Fleas of America.

It is with extreme pleasure we welcome the "Flora of Los Angeles and Vicinity." Its author, Mr. Le Roy Abrams, of Stanford University, has in recent years personally examined the flora of this district and the fruit of his labors are embodied in the handsome volume before us. The nomenclature and arrangement are in accordance with the latest methods; the typographical work is very good.

The description of the species are accurate and original, many new records have been added to the district and not a few new species.

This flora will satisfy all the requirements of the ordinary botanical student in Southern California, while for those of Los Angeles and Orange Counties it will be the standard text-book for many years to come. In our educational institutions this work is indispensable. We heartily recommend the work. Price $2.00 from local publishers.

Transactions for April, 1904.

ASTRONOMICAL SECTION.

At the regular monthly meeting of the Section, held April 18th, 1904, Chairman Knight introduced the exercises with an interesting exhibit of relative distances of planets from the sun as compared to the relative distances of some of the leading stars from their companion stars, showing that the distances that separate the companions of Procyon, Sirius, Alpha Centauri and Castor from their respective principals do not exceed the distance between the sun and our most distant planet Neptune.

Mr. Knight also referred to the apparently remarkable rapidity of revolutionary motion of some of the binary stars as indicated by the rapid succession of a certain variation in the luminosity.

Mr. Melville Dozier then presented the subject of the trisection of an angle, developing a method by which this can be accomplished without resorting to higher mathematics. The method is also equally applicable to the division of an angle into any number of equal parts and to the division of a circumference into any number of equal arcs.

MELVILLE DOZIER, Secretary.

GEOLOGICAL SECTION.

Professor Theodore B. Comstock, the president, presided in the absence of G. W. Parsons, the chairman of the Section. G. Major Taber, secretary of the Section, read a paper on "Mineral Formation and Crystalization" as follows:

Mineral crystals vary from those microscopic size to several feet in length. They are either opaque or transparent, and assume almost every conceivable angle, and I note that in all the mineral kingdom there are over 700 different classifications.

Deposits of beryl, apatelite, copper and many other minerals have been found weighing several tons. The same mineral in different localities exhibits an endless variety of forms, yet their angles are always the same under like conditions.

It has been discovered that all crystals found in nature may be referred to six systems, based on certain relations to their axis.

The same substance often has wide variations. In carbon, for instance, the diamond is pure carbon; transparent, usually colorless, brittle and extremely hard. Graphite, being principally carbon, is opaque, black, tough and soft, and charcoal is very similar.

The law of crystalization should produce perfectly similar forms of the same substance, but disturbing elements and influences produce many radical changes.

Following the paper, Mr. Taber exhibited several specimens of minerals and petrified woods, after which Professor Comstock dwelt at length on the formation and crystalization of various minerals. A general discussion followed.

BIOLOGICAL SECTION.

Los Angeles, Cal., Chamber of Commerce, April 11th. 1904.

The meeting of the Biological Section was called to order by the Chairman.

The minutes of the last meeting were read and approved.

Mr. Wm. H. Knight made an interesting report on the so-called Weather Plant, Abrus precatorius. He also presented a number of the seeds to the Section.

Mr. Ulrey reported on some work which had been done tending to show that the germination of seeds was brought about by definite bacteria.

Mr. Whiting commented somewhat caustically on the action of a surgeon in the city who was reported to have operated on a woman for a frog which she claimed had been in her stomach for a year or more.

The lecture of the evening was delivered by Prof. B. M. Davis, his subject being the structure of the Larval Balanoglossus. The lecture was illustrated by a number of carefully prepared drawings. One interesting feature emphasized by the lecturer was that it is in this form of life that muscles are first found, springing from the central axis. In this and many other representations, the Balanaglossus appears to stand at the base of the vertebrate series of life.

The lecture was discussed at some length by Dr. Houghton. Mr. Knight announced that at the next meeting of the Astronomical Section, Professor Dozier would demonstrate his method of trisecting an angle

About thirty members and visitors were present. The Section adjourned to meet again on the second Monday in May.

C. A. WHITING, Secretary

JUL 12 1904

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BULLETIN
OF THE
Southern California Academy of Sciences

COMMITTEE ON PUBLICATION
A. DAVIDSON, C. M., M. D., Chairman
MELVILLE DOZIER G. W. PARSONS

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A Preliminary Synopsis of the Southern California Cyperaceae.

BY S. B. PARISH.

Eleocharis acicularis radicans, Britton Journ. N. Y. Micr. Soc. 5:105. **E. radicans,** Kunth, Enum. 2:142.

Usually taller; scales tinged with brown; tubercle more acutely conical, enlarged at base, and more evidently discontinuous with the summit of the achene.

Apparently the commoner form throughout the Cismontane region, ascending the mountains to 8,000 ft. alt. Pasadena; Braunton, Greata. San Bernardino; Parish. Tahquitz Valley, San Jacinto Mts.; Hall Bear Valley, San Bernardino Mts.; Parish. Texas to Southern California.

++ ++ *Achenes obscurely puncticulose.*

4. **Eleocharis disciformis,** n. sp.

Fibrous rooted annual; culms slender, striate, 10-15cm. tall; spikelet lanceolate, 5-10 mm. long, 10-15-flowered; scales brown, with a pale midvein, the lowest broadly ovate, the others ovate-oblong, obtuse, about 2mm. long; bristles 5, exceeding the achene, which is ovoid to obovoid, and 1 mm. long; tubercle depressed and disciform, abruptly mucronulate, less than one-fourth the length of the achene.

Eastern base of the San Jacinto Mts., on the borders of the Colorado Desert, June, 1901; 2013 H. M. Hall.

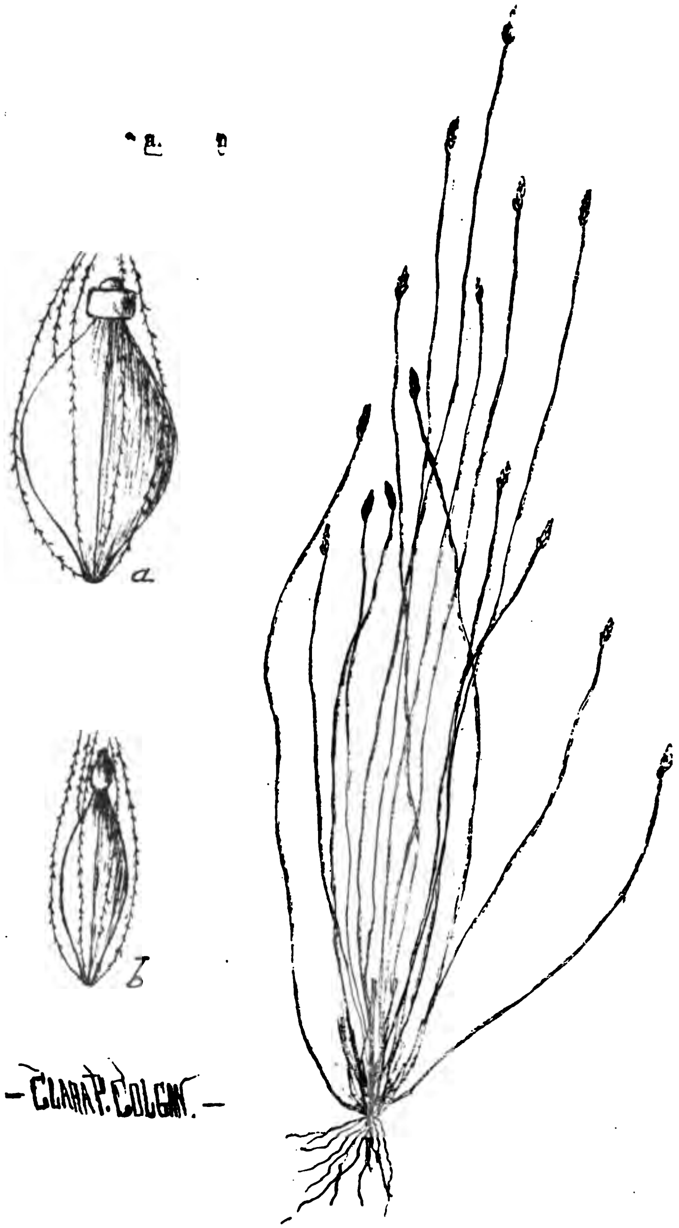

PLATE VI.

ELEOCHARIS DISCIFORMIS, (Parish).

Plate VI. Plant life size, drawn from the type specimen a, mature, and b, immature achene, from the same spikelet, each X35.

++ ++ ++*Achenes smooth and shining.*

5. **Eleocharis montana,** R. & S. Syst. 2:153. Britt. Jour. N. Y. Micr. Soc. 5:109. **E. arenicola,** Torr. in Engelm. & Gray, Bost. Jour. Nat. Hist. 5:237. Watson, Bot. Cal. 2:222.

Culms clustered, from a slender dark brown rootstock, slender, striate, about 1 dm. tall; spikelet oblong, lem. or less long; scales ovate, brown with green middle, 2 mm. long; bristles 5-6, exceeding the achene; achenes oblong-obovoid, pale, 1-1.5mm. long, the tubercle conic, broadened at base.

Rather common in the Cismontane region. Los Angeles; Davidson. Witch Creek, San Diego Co.; Alderson. San Bernardino; Parish. Mexico and north to Florida and South Carolina; on the Pacific Coast confined to Southern California.

Plate VII. Plant X2-3, a, Scale X15. b, Achene X20.

6. **Eleocharis Parishii,** Britton. Jour. N. Y. Micr. Soc. 5:110. Coville, Death Vall. Rep. 211.

Culms slender from slender rootstocks, 1-1.5 dm. tall; spikelet linear-lanceolate, acute, 1-1.5 cm. long; scales ovate to ovate-oblong, 2-2.5mm. long, obtuse, castaneous, the margins hyaline; bristles 4-5, exceeding the achene; achenes ellipsodial, pale, 1mm. long, the tubercle calyptrate, obscurely broadened at base, about one-fourth as long as the achene.

By stream banks in the Desert region. Palm Springs (Agua Caliente), 500 ft. alt., Colorado Desert, April, 1882; 1569 Parish type. West shore of Owens Lake, 3,500 ft. alt., Mojave Desert, June, 1891; 999 Coville and Funston. Eastern slope of Walker Pass, Kern Co., 3,900 ft. alt., 1014 Coville and Funston.

+ +*Sheaths somewhat obliquely truncate; tubercule continuous with the achene, seperable at maturity.*

7. **Eleocharis rostellata,** Torr. Fl. N. Y. 2:347.

Culms slender and wiry, lax, 3-5m. long, the sterile culms 1-1.5m. long, rooting at the apex; spikelets oblong, acute, 1cm. long, and a third as thick, 10-20 flowered; scales ovate to ovate-oblong, stramineous or light brown, bristles 4-6, exceeding the oblong-obvoid (1.5mm.) achene; tubercle conic-subulate, less than one-half as long as the achene.

Probably common in wet meadows throughout the Cismontane region, but the only specimens seen are of my own collecting at San Bernardino. The species is found throughout temperate North America.

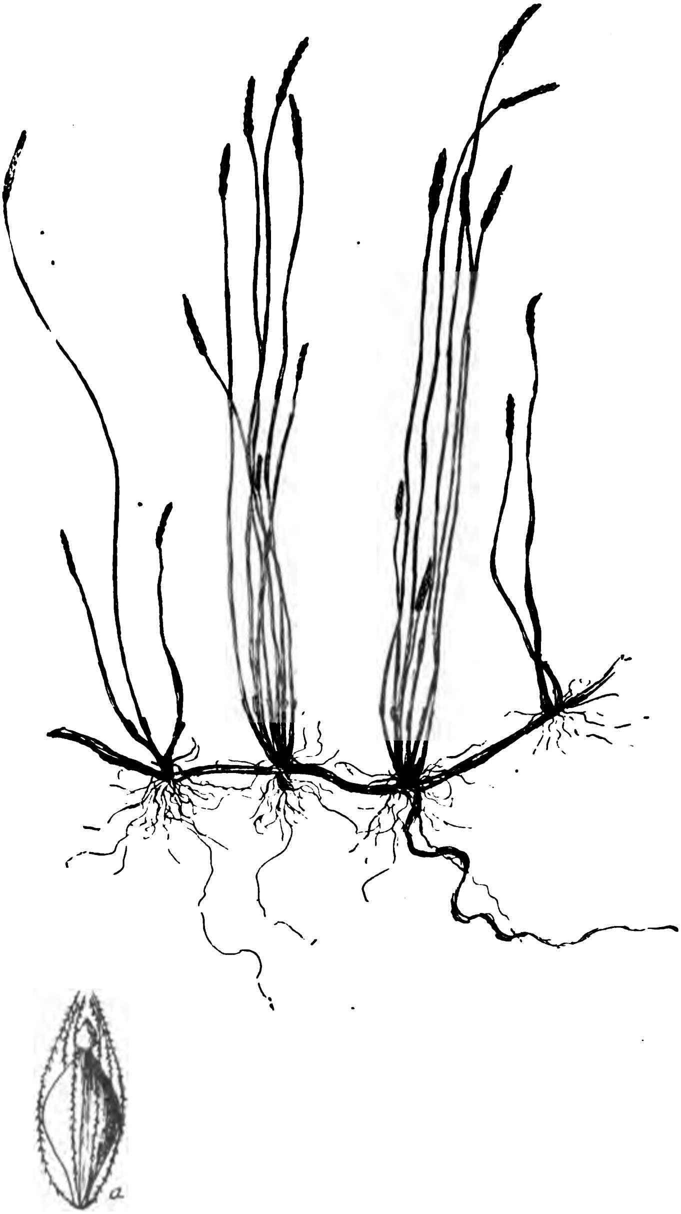

PLATE VII.

ELEOCHARIS MONTANA, (R. & S.)

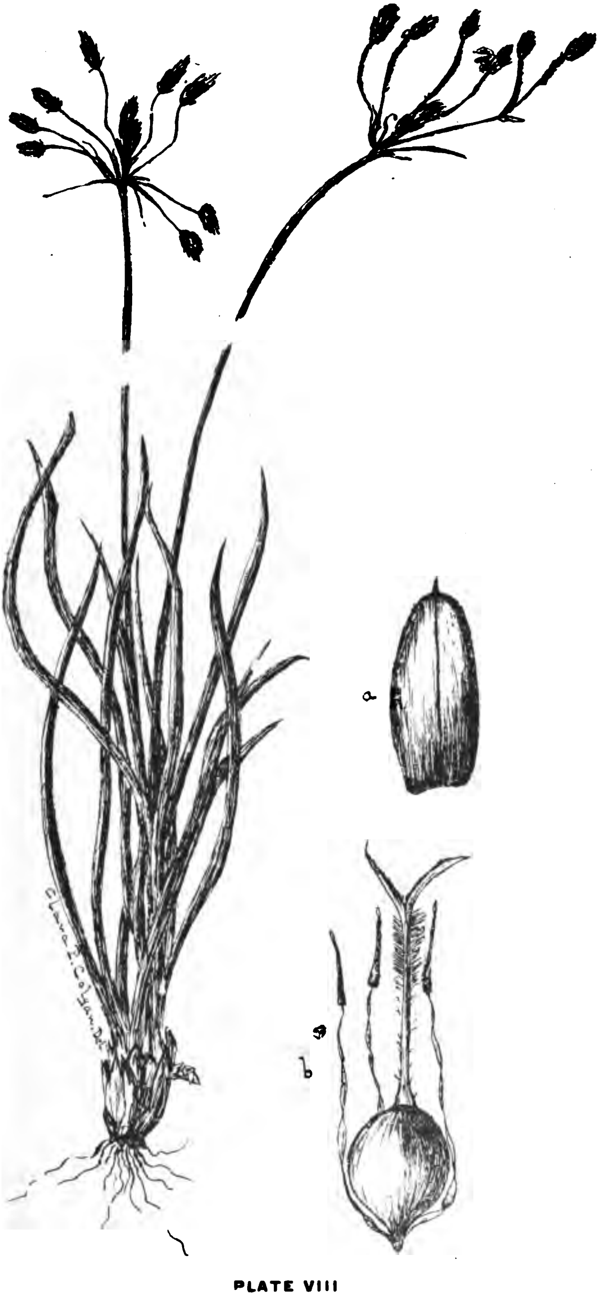

PLATE VIII

FIMBRISTYLIS THERMALIS. (Watson).

4. FIMBRISTYLIS *Vahl. Enum. 2:85.*

Annual or perennial herbs, with culms leafy at base. Spikelets terete, several or many-flowered. Scales all fertile, spirally imbricated, mostly deciduous. Perianth none. Stamens 1-3. Style 2-3-cleft, often flattened and ciliate, enlarged at base, but wholly deciduous at maturity. Achenes lenticular or 3-angled.

A genus of 150 species, or more, mostly of tropical or sub-tropical climes; sparingly represented in North America. The following is the only species reaching our region.

1. **Fimbristylis thermalis,** Watson, U. S. Geo. Expl. 40th Par. 5:360; Bot. Cal. 2:223.

Perennial by horizontal, jointed, scaly rootstocks; culms few-clustered, flattened, scabridous, 4-6 dm. tall; leaves 2-3 mm. wide, rough-margined, shorter than the culms; involucral leaves 2-4, much shorter than the rays, subulate, with broad pubescent bases; umbel compound, rays 3-8; spikelets 5-15, ovoid, becoming oblong at maturity and 2cm. long; scales pale brown, concave, oblong, 4 mm. long, the midrib excurrent as a stout mucro at the obtuse apex; stamens 3, the filaments flattened and the anthers tipped with a subulate appendage; style ciliate, 2-cleft; achenes ash colored, shining, minutely perpendicularly striate, obovoid to globulose, 1mm. long.

In soil moistened by warm water, Arrowhead and Waterman Hot Springs, 1750 ft. alt., in the foothills of the San Bernardino Mts., near the town of the same name; Parish. It has been collected at hot springs at several places in Kern and Inyo counties, and in Ruby Valley, Nevada. The type was collected in Owens Valley.

Plate VIII Plant: the umbel at the left in flower, that at the right mature, the scales mostly fallen away. a. Scale X6. b. Achene, X12.

The Bees of Southern California. V.

BY T. D. A. COCKERELL.

Xylocopa.

Fulvous, with fulvous pubescence; very large........ 1
Black 2
Dark blue or green 5
1. Abdomen largely fuscous (Khasia Hills, India).... .... **rufescens, Smith.**
Abdomen entirely fulvous (So. Calif)............. .... **varipuncta,** Patton, male.
2. Large, over 25 mm. long (So. Calif)............... .... **varipuncta,** Patton, female.
Smaller, less than 20 mm. long.................... 3

3. Clypeus yellow(California........**orpifex,** Smith, male.
   Clypeus dark 4
4. Top of head greenish, face with light hair (Surinam)..
   ....**barbata,** Fabr., female.
   Top of head black, face with black hair (California)..
   ....**orpifex,** Smith, female.
5. Bottle-green (Northern California)..**Californica,** Cresson.
   Dark steel-blue (So. Calif).......................
   ....**Californica arizonensis** (Cresson.)*

Xylocopa varipuncta. Patton.

Collected by Dr. Davidson at Los Angeles; I have taken it at the same place. It ranges east to Tempe, Arizona, where it has been taken in numbers by Mr. Irish. It is very interesting to find that an Indian species **(X. rufescens)** is so like the male of **varipuncta** that it is difficult to point to any important distinction. However, in **rufescens** both sexes are fulvous. My material of **rufescens** is from Mr. Sladen. **X. fimbriata.** Fabr., is said to have been taken in the Yosemite Valley, but I have little doubt that the specimens were **varipuncta. X. fimbriata** is a neotropical species; the most northern record that can be trusted seems to be Tepic, Mexico. It is easily distinguished from **varipuncta** by the fact that the female has a ridge on the vertex of the head, interrupted in the middle, and laterally elevated into conspicuous tubercles.

Xylocopa orpifex, Smith.

Obtained by Dr. Davidson at Los Angeles, Rock Creek and Tehachapi. It goes north to Oregon, and is one of the most characteristic bees of the Pacific Coast.

Xylocopa californica arizonensis, (Cresson).

Collected by Dr. Davidson at Los Angeles; it goes east to New Mexico, and Dr. L. O. Howard has collected it as far south as San Jose de Guaymas, Mexico. In Northern California it is replaced by the true **californica.** I reduce **arizonensis** to subspecific rank because it seems to have no valid structural characters, and the color is not altogether reliable. Mr. J. A. G. Rehn has very kindly compared Cresson's types of **californica** and **arizonensis,** and finds that both have the tubercle before the anterior ocellus in the female. The color is very different, but Mr. Rehn says that one of Cresson's types of **californica** has the abdomen colored as in **arizonensis.**

*The species from other regions are included for comparison.

Anthophora.

There are several species of **Anthophora,** belonging to the subgenus **Amegilla,** Friese, in which the hind-margins of the abominal segments have a chalky-white, ivory-colored or occasionally quite yellow appearance, not at all due to hair. At first, they look very like the species with white or whitish hair-bands, but a close examination shows that the color is in the tegument itself. The males of these species may be distinguished as follows:

Face-marks white or whitish........................ 1
Face-marks yellow 5
1. Thorax with black and dull white hair mixed; sides of clypeus very broadly bordered with black; apex of abdomen with two short spines, (New Mexico)... ....**cleomis**, Ckll.
Thorax without black hair......................... 2
2. Hair on thorax pale yellowish..................... 3
Hair on thorax dull white or grey.................. 4
3. Clypeus with subbasal black spots (Illinois)......... ....**Walshii**, Cresson.
Clypeus with subbasal short black lines (Colorado &c.) ....**Smithii**, Cresson.
4. Clypeus with subbasal black spots; apex of abdomen with a concave truncation (New Mexico)........ ....**marginata**, Smith.
5. Thorax with black hair............................ 6
Thorax without black hair......................... 7
6. Length 13 mm. (Mexico)................**tarsata**, Dours
Smaller (So. Calif) ....**tarsata subtarsata**, n. subsp.
7. Hair of thorax fulvous (California to New Mexico).. ....**californica**, Cresson.
Hair of thorax whitish (Los Angeles, Calif)........ ....**quinquefasciata**, Provancher.

There remains one species, **A. texana**, Cresson, of which the male is unknown. The female has the hair of the thorax ochraceous, slightly mixed with black.

Anthophora tarsata subtarsata, n. subsp.

One of each sex taken by Dr. Davidson at Los Angeles. The female is a little less than 12 mm. long, and agrees with the description of **tarsata** except that it is smaller, the hairs on the sides of the ventral segments of the abdomen are white (pale fulvous in **tarsata**), the brush on the end of the first joint of the hind tarsi is ferruginous (black in **tarsata**), and the legs are black (expect for the hair) with only the tarsi dark ferruginous. It agrees in size with **A. texana** (from Texas), but differs by the hair on face and cheeks being ochraceous (white in **texana**), the apical part of the mandibles dark reddish (yellowish in **texana**), the hair of vertex and thorax being copiously mixed with black, and the abdominal segments beyond the first having much short black hair. The male is a little over 11 mm. long, similar to the female but with the labrum, clypeus, supraclypeal band, lateral face-marks, large mark on mandibles, and under side of scape all yellow (reddened by cyanide in the specimen studied). The thoracic pubescence is quite bright fulvous, mixed with black. The apex of the abdomen is broadly rounded, with a deep median notch; not at all spinose. Legs colored as in the female; middle tarsi simple; hind femora greatly swollen; hind tibiae broad and thick, with a strong apical tooth; basal joint of hind tarsi broad, ferruginous, with two teeth, the first one much the longest. There is a small black spot on each side of the clypeus.

I had thought that this might possible be **A. quinquefasciata,** Provancher, which I have not seen; but Provancher describes the thoracic pubescence as "blanche," and says nothing about any intermixture of black; neither does he mention any spines on the hind tibiae and tarsi.

BOMBUS.

Bombus californicus, Smith.

This handsome species is easily known by its black color, with the hair on the anterior part of the thorax, and a band on the hinder part of the abdomen, yellow. The typical **californicus** has the hair of the head black, but in the variety **columbicus** (Dalla Torre) the hair of the face and the middle of the top of the head is yellow. In the specimens seen by me, the malar space of the female is considerably larger in **californicus** than in **columbicus,** and for this reason I am strongly inclined to restore the latter to the rank of a species. It would be a matter of considerable interest for the naturalist of California to investigate the matter, and see whether the two kinds ever come from the same nest. Dr. Davidson has collected both kinds at Los Angeles, and the true **californicus** also on Catalina Island. A worker of **columbicus** was obtained by him at Bear Valley. The **columbicus** form was also collected by Mr. Ehrhorn at Alum Rock Park, San Jose, Calif., in 1902.

Bombus edwardsii, Cresson.

Two taken by Dr. Davidson at Los Angeles. Differs from **B. californicus** in having the hair of the scutellum and base of abdomen yellow. As regards the banding of the abdomen, **B. edwardsii** is to **B. prunellae,** as **B. ternarius** is to **B. juxtus.**

Bombus sonorus, Say.

San Pedro, common (Cockerell). Visits flowers of **Datura meteloides** early in the morning. A species with the pubescence mainly yellow, but black between the wings and on the pleura.

Psithyrus californicus, (Cresson.)

Taken by Dr. Davidson at Los Angeles and Switzers. This is known only in the male, and in all probability it will prove to be a male **Bombus,** like the structurally similar "**P.**" **elatus.**

Flora of San Clemente Island. II.

BY BLANCHE TRASK.

There is but one man who knows San Clemente Island. This is John Robearts, and he has lived on the island over twenty years. I have named the most remarkable and picturesque of all the gorges on the north coast "Robearts' Gorge," in commemoration of his heroic explorations for the love of nature in its sternest forms. This gorge can be plainly viewed from a ship at sea, its pinnacles uplifted for a thousand feet. It lies a half hour's row westward from Mosquito Harbor and can easily be recognized.

Generally, there is that wind from the west; at times it brings a wild storm of sand, when the very air is thick and you have to watch your guy ropes from early morn to night, and 'tis well if even then the breath abates—yet gentle days intervene when the placidity is dream-like.

An interesting phenomenon may be constantly observed from the heights. Great banks of cloud seem continually to be drawn to the highest elevation on the north crest, and when about one mile off shore evidently there is encountered an opposing force, for turmoil ensues and dissolution follows, with the result that although the larger part of the cloud-rack continues its old course and reaches the height, yet another portion is lost. It hesitates, is carried far out to sea and eventually rounds the extreme west end and drifts along the dunes of the "Sou'-west Harbor."

"—Puts forth an arm and loiters,
slowly drawn——"

Once observed-twice-thrice! You begin to think it is more than an accidental occurrence. It gratified me afterward to find it was made note of by the U. S. Coast and Geodetic Survey. Johnny says it has been going on ever since he can remember.

In the deep gorges under these beclouded headlands and on the bold steeps is the growth remarkable as would be expected.

Small stunted groves of Lyonothamnus floribundus var.

asplenifolius are occasionally met on the south coast heights, but it is on the north coast that it ever follows—who can say why—ledges of exposed rocks as trails and under these beclouded crests it marches in long defiles like a conquering army, one to two feet in diameter; ten to twenty-five feet high; strong, heavy trunks, and never an entire leaf; it should stand as a species by itself; the same tree which thrives in similar exposures on Santa Cruz and Santa Rosa Islands, while on Catalina, the trees have a different aspect; entire leaves, and assume tall tapering figures.

Under these same heights in San Clemente, too, the oaks are seen in companies; Quercus tomentella and Q. chrysolepis, low and defiant often, with gray dead tops and outspread limbs; gnarled trunks one to two feet in diameter; you can skirt the coast-line in a skiff and look up and count the companies of the oaks and Lyonothamnus trees by defiles as you pass rowing; count them to the very summits.

The descent from the heights to the sea in these regions is perilous in the extreme. Clovers are four to six feet high, Trifolium tridentatum being the most common growth, is so dense under the feet that neither trail nor rocks can be discerned and you have to feel your way with hands and feet over jagged rocks, while the strong clovers trap you at every step like vines.

Trifolium Palmeri is common, nearer the sea than T. gracilentum or T. tridentatum.

Besides all these hindrances, there is yet to be mentioned the chains which guard San Clemente Island, whose links are caves innumerable. It is a relief to the eye to come across a stretch which has not its gaping rents; the gorge is everywhere present and the rock-strewn terrace and the leaping arroyo; but the light of the caves is the Convolvulus macrostegius.

There is one open mouth on the "nor'-west" coast where the Dendromecon flashes—never in truer glory or more profusion of bloom. It was also seen towards the East End at the heads of some of the precipitous dips, seven years ago, though of course not so large as in this protected mouth.

Antirrhinum speciosum is as common in every break as are the boulders which take their places as sand on the beaches; happy under all circumstances; enkindling the darkest gulches where the o'er-toppling walls are shutting out the sky.

Cereus Emory traverses the entire south coast, swinging from many a gaping cave, while Opuntia prolifera increases in numbers as you near the East End, until it fairly besets the trail, making it a serious undertaking for foot of man or beast. Opuntia Engelmanni var. littoralis is not frequent, but seems to bloom profusely and to bear well in an occasional spot.

Dr. Rose finds two new species of Stylophyllum and strangely enough, one hides in the west end and one at the east end of the Island—S. albidum and S. virens respectively.

Johnny tells me Viola pedunculata is singularly fragrant —"like the odor of peaches"; I found only the crisping pods and seeds.

White flowers, or white with veins of magenta, abound amid the ordinary magenta ones of Mirabilis California.

A new Astragalus spreads its silver leaves along the golden sands of the West End dunes; this is to be Robeartsii Eastwood, while A. Nevinii looks out at the "Sou'west" Arrowhead Point and seems by its very isolation to be preserved for future ages, its shaggy mantle of black hair recalling at once A. Traskiae found on San Nicolas Island, although the latter is a more handsome plant.

The Mesembryanthemum crystallinum at the west end very properly gives you not a thought beyond recognition of its usual happy style; but when it leaves its dunes and is your companion for miles and miles on the outspread uplands, you begin to give it more thought and to see that its sway is remarkable. Johnny says it increases yearly, and can recall when it never left the dunes. It now runs almost to the center on the tableland heights, to the exclusion of nearly all other plant-life; it soaks boots and leggings and makes "time" impossible in its region.

The little Eschscholtzia ramosa (which could never be confounded with Eschscholtzia Californica by any one who had been familiar with the former in the field, is often met in arid places, six to twelve inches high, its flowers usually not an inch in diameter, with ever a strange glaucous light upon its leaves.

A tree daisy truly is Encelia Californica found in "Chalk Cliff Canon;" one to four inches diameter and ten to twelve feet high.

Euphorbia misera holds a little colony of its own in the most picturesque of all the arrow-head points, where, in a broken edge, it is one to two feet high and one to three inches in diameter, with peculiarly blunted branches and creeping ways.

In many a moist nook of the great north coast gulches, thrives a Ribes, appearing strangely domestic and robust in these surroundings; becoming tree-like, even twelve feet high and eight inches in diameter, although it is usually shrubby.

The Prunus, which grows in all parts of San Clemente where it can gain a foothold, should be given specific rank; it is identical with the one at Catalina Island, which is not the variety of Ilicifolia that it has been made. In the deep recesses of San Clemente's gorges, it attains a height of thirty feet with as great a spread, and measures one to three feet in diameter. The fruit is luscious—its pulp a quarter of an inch thick. The pits have been sent to Santa Ana to the experimental gardens, where Professor Pierce hopes to reduce the stones and increase the pulp, thus securing to California a cherry which will thrive in low-lands.

In one locality, Crossosoma Californicum was seen—a few shrubs ten feet tall crowded into a cleft, yet in both flower and fruit; a peculiar form of Rhusvata is on the same height, about four feet high shrubby.

Adenostoma is found on the arid heights of the north coast and Ceanothus macrocarpus at rare intervals; both ten to twelve feet high and one to six inches in diameter.

Sambucus glauca is a handsome tree in northern slopes, while Lonicera finds a few moist and shaded spots in which to thrive.

In one locality—an old harbor—Brassica nigra flourished six feet tall.

Senecio Lyoni stars the land, along with "the turquoise flower," Gilia Nevinii; with the fiery little snap-dragon Antirrhinum speciosum common; and along the sea-edges Eriophyllum Nevinii abides and, remembering the frequency of the dainty clover, Trifolium Palmeri, you have in San Clemente a galaxy, one plant of which is worth going a hundred miles to see.

The memory of a little clump of Lycium at the "Nor'-west harbor" was fresh in my mind upon my second trip last year; it looked different from usual and was of course not L. Californicum, which covers vast areas to westward; both fruit and flower upon my second trip confirmed my suspicions. Miss Eastwood sends word it is none other than Lycium Richii, the only known plant in the United States being at Avalon, although, to be sure, it is common in Baja California.

Finding Aphanisma blitoides along the sea-cliff edges and Malva exile in old Indian mounds was typical of what is known of their habits on Catalina.

Rhus integrifolia is here a shrub generally, although in favored situations it is over one foot in diameter.

Rhamnus crocea is an occasional sight in the south coast arroyos; old and gnarled trunks twelve to eighteen inches diameter.

A gay **rose-pink** Cnicus Occidentalis is not typical, but occasional here.

In the dunes Franseria and Abronia maritima and A. umbellata are seen.

The blending of Collinsia bicolor is on all the favored nooks toward the Pyramid Head, East End.

One shrub of Baccharis holds forth alone in the treeless region of the west end; while in the hot days of last November in the south arroyos, I came across two or three shrubs which appeared to be a "sp. nov." of Baccharis, according to Miss Eastwood.

At the far sand reaches of the east end one Atriplex Breweri(?) stands besides the sea; in November a beautiful sight of waving golden bloom eight feet tall.

A long disputed question of species of Suaeda was settled by finding a desired development on San Clemente shores; an insular form seen on San Nicolas and Sta. Barbara Islands.

The little Saxifraga blooms brightened all the arid western regions in November, bursting as by magic through the hard soil; also Eriogonum nudum and E. gigantea were frequently beheld; while Atriplex expansa was ever "tumble weed" in the trail, an actual encumbrance.

A new Malacothrix overhung many an inaccessible gorge in October and November, with its great masses of lavender flowers in atonement for its rank leaves; another Compositae which was not in bloom, was found in better condition in June and may prove a Hazardia interesting; also yet another species of Hazardia was discovered in a remote canyon.

Galium Catalinense was often seen in happy state-climbing; Lotus Traskiae in some localities, though rare; a strange Castilleia here flourishes, with rich canary-colored bracts shrubby, two to four feet tall.

On the main southern flats in May, Plantago Insularis and Oligomeris were common; while Phacelias lay along the trail like bits of fallen sky.

Lamarkia aurea, the "Knight's Plume" of Catalina waves also here.

An old Lupine which has long grown at Catalina and which seem to be a variety of L. truncatus was frequently seen in San Clemente Island also, besides other Lupines which sprang easily in that rich old soil.

Lavatera assurgentiflora was twice found—one tree eight inches in diameter—looking into the sea from a cliff near Mosquito Harbor; another in a region of Pot's Valley pointed out to me by Johnny; it was a foot in diameter and twelve feet high: low and bent and splitting at base.

Johnny tells me that formerly there were many "Malva Rosas" as he calls them; some even on the south coast; mostly eaten by cattle in years when feed was scarce. He recalls their forming groves.

Malva parviflora grows in abundance near Gallagher's; is often six feet tall.

Marubium vulgare is to be seen at the "Nor'-west Harbor" along with Salicornia in fine condition in a sort of marsh-inland.

A peculiar form of Oenothera, for long years known at Catalina, is to receive recognition at last. Common near the sea, prostrate—with curling bark—woody at base.

An "island" of Hemizonia fasciculata above Pot's Valley attracts wonderment amidst the sea of Mesembryantheum which surrounds it.

Hemizonia Clementina Brandegee is a shrubby form which is often seen one to two feet tall towards the westward; this also grows in Catalina.

The gay flowers of Pentstemon cordifolius which merit the common name of "Coral String" given them in Catalina, surprise you in many an opening in a gorge on the north coast.

PUBLICATIONS RECEIVED.

"Bulletin of the New York Botanical Garden," Vol. 3 No. 10.

"Poultry Management," Maine Agricult. Exp. Station. Bulletin No. 100.

"Plantal Yucatanae," Field Columbian Museum, Val III, No. 2. Botanical Series.

"Proceedings of the Sixteenth Annual Meeting of the Association of Economic Entomologists," U. S. Dept. Agricult. Bulletin No. 46. Entomology.

"Experiment Station Record," U. S. Dept. Agricult. Vol. XV. No, 8.

"Spindle Formation in the Pollen—mother—cell of Cassia tomentosa." L. by Henri T. A. Hus. Proceedings of the Cal. Acad. Sciences, Vol. 2, No. 2. Botany.

"Missouri Botanical Garden, Fifteenth Annual Report."

Transactions for May, 1904.

ASTRONOMICAL SECTION.

The regular monthly meeting of the Section was held this evening at the usual hour and place. In the temporary absence of the chairman the meeting was called to order by the secretary, and Mr. B. R. Baumgardt was appointed chairman pro tem. This being the constitutional time for the annual election of officers, that business was entered upon, resulting in the choice of Mr. Wm. H. Knight as chairman and Mr. Melville Dozier as secretary for the ensuing year. The acting chairman then read an extract from "Nature," giving the views of Prof. Mendeleef, a noted chemical philosopher, relative to the more attenuated gases of space, in which he contravenes Thompson's theory of electrons.

The paper gave rise to some interesting discussion, participated in by Dr. Bullard and Mr. Baumgardt, but without definite conclusion.

Mr. Baumgardt called the attention of the Section to the important astronomical constructions and improvements projected and under way at Mount Wilson and Mount Lowe, under the supervision of Prof. Hale of the Yerkes Abservatory and his associate astronomers.

This is justly regarded as a matter of congratulation, not only on behalf of the Astronomical Section, but as well on the part of the entire Academy and the community at large.

Chairman Knight having arrived, with the speaker of the evening, the chair was surrendered to him and in the course of certain felicitous remarks, the introduced Bishop Warren of the Methodist General Conference. The Bishop, who is the author of some works on astronomy, and a man of broad culture and accurate scientific attainments, proceeded to entertain and instruct the Section in a most delightful manner.

In eloquent terms he depicted the fascinating beauties of astronomy, intermingling with the serious and the severely scientific much of his charming wit.

At the close of Bishop Warren's address, the chairman presented the subject of La Place's "Invariable Plane," indicating the views of certain eminent mathematical astronomers in regard thereto, and illustrating the same by diagrams.

After some discussion of this topic by the chairman and Mr. Baumgardt, the meeting adjourned.

MELVILLE DOZIER, Secretary.

May 16, 1904.

BIOLOGICAL SECTION.

The meeting was called to order by the chairman. The minutes of the last meeting were read and approved.

A brief report on the Trichina spiralis illustrated by a microscopic specimen was presented by Mr. Whiting.

Prof. Ulrey reported that Prof. Ungo de Fries was going to carry on extensive investigations at the University of California during the coming summer, on the problem of the Origin of Species.

Prof. A. B. Ulrey was elected chairman and C. A. Whiting was elected secretary.

The lecture of the evening was given by Dr. Leonard, City Bacteriologist, on **Some Bacilli related to the Bacilli of Tuberculosis.**

The lecture was instantly interesting and highly practical. The lecturer pointed out the fact that there are certain barteria which live upon grass whose staining reactions are the same as the bacillus of tuberculosis. The speaker expressed the opinion that the bacilli of human tuberculosis and bovine tuberculosis are identical, but stated that further investigation is necessary to positively prove their identity.

A great many questions bearing on the practical side of the work of the bacteriologist were asked and were clearly answered by Dr. Leonard.

About forty-five members and visitors were present.

The Section adjourned to hold its final meeting for the year on the second Monday in June.

C. A. WHITING, Secretary.

May 9, 1904.

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VOL. III. OCTOBER, 1904 NO. 7

BULLETIN
OF THE
Southern California Academy of Sciences

COMMITTEE ON PUBLICATION
THEO. B. COMSTOCK, S. D.; A. DAVIDSON, C. M., M. D.; WM. H. KNIGHT.

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MAILED OCTOBER 27, 1904

Important to Members

The Board of Directors has instructed the Committee on Publication to employ every possible means to make the Bulletin an efficient means of communication with the members of the Academy, and we indulge the hope that our endeavors may lead to greater interest than has heretofore been shown in the important aims of this worthy organization.

But we are compelled to be frank and to inform the members that the financial support given to the Board is now entirely inadequate to the needs. A little effort on the part of each to add to the membership will mean much in growth and increased influence of the Southern California Academy of Sciences. **See that your dues are promptly paid, and secure one or more members. IT WILL PAY YOU WELL.**

A very important step was taken by the Board in accepting the courteous offer, by the authorities of the Southern California State Normal School, of the use of suitable rooms for the meetings of the Academy and its sections, the limited quarters at the Chamber of Commerce having proved expensive and inadequate.

The position occupied by the Southern California Academy of Sciences is too little understood in this community. Quietly, but steadily, for a dozen years, a little band of devoted workers has been building up an organization which is accomplishing much good in two important directions.

First—We do not believe that its own members fully realize the extent of its contributions to knowledge of local natural history.

Secondly—The Academy has stood for the popularization of Science, not by cheapening nor by lowering the standard, but by presenting to the public in simple language the results of technical research in various branches.

There is a spirit in the Board of Directors and in the several working sections, which will not permit any falling off along these lines. So far as lies in the power of the officers, each succeeding year will show adequate gain in strength and effectiveness. Already the Bulletin, the official mouthpiece of the Academy, has taken high rank for its contributions in special lines of Science. We must not stop where we are. Surely there are men and women enough in Southern California who are in sympathy with the purposes of this organization to provide by annual dues for the mere sustentation of such an institution in our midst. One good friend, whose modesty keeps his name out of this writing, has always shown his faith by his works; but among the many whose means are ample, there are few to rise to a clear perception of what space our Academy actually fills in the moral and intellectual life of this region. It is not too late, but neither is it too early, to lay plans for wider growth and greater influence. We sorely, sorely need a home of our own, centrally located, where the library we are accumulating and the museum we can have without asking may be housed securely, and where the willing hands we have at command may undertake the tasks which belong to us, and not to those who now perform them from afar with funds supplied elsewhere.

What will you do, kind reader, as your share in this undertaking? What will you do today? If not a member, aid us by joining the Academy, not only to increase needed funds, but to encourage us by your presence at lectures and by suggestions from your experience. If already one of us, do not rest content until you have told others of our plans and work. If you are benefited, help us to enlarge the sphere of our influence by adding to the membership.

This issue of the Bulletin is especially designed as a campaign document. Our motto is: "*Never let up, never let down.*"

Annual Report of the Secretary to May 1, 1904

To the Board of Directors of the Southern California Academy of Sciences:

Gentlemen: I herewith present the report of the Southern California Academy of Sciences for the fiscal year 1903-1904.

The Sessions opened September 11, 1903, and closed May 2, 1904.

This, the 13th year of activity of the Southern California Academy of Sciences, has been one of unusual interest and value to its members. The number of lectures given by the Academy and its Sections was 28; these have been confined to scientific subjects. While, perhaps, the attendance has, on the whole, not been as satisfactory as in former years, it has, nevertheless, been as large as could be expected, bearing in mind that the Academy has been constrained to hold its Sessions in the residence section of the city.

The attendance has also been such as to indicate that the purpose of the Academy lectures should be to lay special stress on popularization of science.

Summary of Lectures by the Academy and Its Sections.

"Late Results in Celestial Photography," by B. R. Baumgardt.

"Earthquakes," by F. C. Crosby.

"Scientific Commercial Standards," by Alvin H. Low.

"Ether and Gravitational Matter," by Edward L. Larkin.

"Deposits of Alkaline Salts," by Julius Koebig.

"The Cactaceae," by A. D. Houghton.

"Radium," by Edgar L. Larkin.

"The Sun as the Lighthouse and Furnace of the Earth," by John Woodbridge.

"Origin of Petroleum," by C. J. Callahan.

"The Technique of Blood Examination," by Louisa Burns.

"Concerning Fleas," by J. J. Rivers.

"The So-called Kissing Bug," by Anstruther Davidson.

"The Manufacture of Explosives," by E. H. Fosdick.

"Oxygen," with experiments, by Wm. M. Friesby.

"Sweden," by B. R. Baumgardt.

"Herbert Spencer's Symposium," by President Comstock, Rabbi S. Hecht, Elizabeth Cheney, W. A. Spaulding, W. A. Cheney, B. R. Baumgardt.

"Malaria," by F. B. Gamber.

"Physical Geography and Geology of Brazil," by Theo. B. Comstock.

"The Nissl Bodies," by Louisa Burns.

"Radio-Activity of Metals," by E. M. Wade.

"Anemia and Leukemia and Ehrlich's Theory of Immunity," by C. A. Whiting.

"Food and Food Products and Their Adulterations," by Julius Koebig.

"Midwinter Birds of Los Angeles, Etc.," by Joseph Grinnell.

"Autogeny and Phylogeny of the Eye," by Lyman Gregory.

"The Sun" (illustrated), by George E. Hale.

"The Larval Balanoglossus," by B. M. Davis.

"The Chemical Geology of Sedimentary Deposits," by Frank I. Shepherd.

"The Relation of Electricity and the X-Ray to Radioactivity," by O. Shepard Barnum.

"Mineral Formation and Crystalization," discussed by G. Major Taber and Theo. B. Comstock.

"The Principles of Logarithms and the Paradox of the Conchoid Curve," by B. R. Baumgardt.

"Some Bacilli Related to the Bacilli of Tuberculosis," by Dr. Leonard.

"Cliff Dwellers of the Southwest," by Mrs. Charles Nelson Green.

"The Trisection of an Angle," by Melville Dozier.

"Desert Views and Desert Development," by John Stewart.

"Polarization of Light," illustrated. S. J. Keese, demonstrator, with explanation by Messrs. Dozier, Whiting, Houghton and Comstock.

Financial.*

Received from membership and dues	$591.00
Gift from Mr. J. D. Hooker	100.00
Total	$691.00
Paid over to Treasurer	$691.00

There has been added to the Academy during the year one life member, Dr. Theodore B. Comstock.

The only source from which the Academy draws its income at present is the membership dues. These are barely sufficient to cover the expenses, which are principally made up of the expense of publishing the Bulletins, hall rent and lantern services. The Secretary, therefore, desires to take this opportunity of expressing the hope that all members, in the future, will pay their dues promptly and that each member will also consider himself a committee of one for the purpose of bringing in new members to the Academy and especially, if possible, some life members. The Academy needs funds for various undertakings which, on account of the expenses involved in same, it finds itself unable at present to undertake.

B. R. BAUMGARDT, Secretary.

———————

Professor Melville Dozier, Vice President of the State Normal School, now President of the Academy, is peculiarly fitted for the honor justly conferred upon him. His work for years as a member of the Board of Directors and as an officer of the Astronomical Section, as well as his important papers read before the Academy and Section evince great interest in the aims and purposes of the Academy, and he has taken hold of the new duties with an earnestness which bespeaks good progress in the current year.—[Editor.]

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*The Constitution provides for an annual meeting of the Academy in May, at which time it is expected that the reports of Secretary and Treasurer will be presented. Inasmuch as the Treasurer goes out of office at the beginning of June and his final report must be made up to May 31st, there is liable to be some discrepancy in the receipts reported by the two officers. This will be overcome by the new rule of the Board placing the collections in the hands of the Treasurer. At the first meeting of the new Board in June, 1904, the Auditing Committee reported the accounts of the Treasurer correct and in order, the difference apparent in the two reports at the Annual Meeting in May having been due to the above cause. By closing the Treasurer's books in June the discrepancy disappeared.—[Ed.]

Annual Report of the Treasurer to May 31, 1904

To the Board of Directors, Southern California Academy of Sciences:

Gentlemen: I have the honor to submit the following financial report for the fiscal year ending May 31, 1904.

Reported receipts by A. Davidson, Treasurer, May 1 to Sept. 21, 1903 (including amount on hand May 1)	$357.99
Reported disbursements	306.98
Balance turned over by former Treasurer	$ 51.01
Total receipts from Secretary, Sept. 22, 1903, to May 31, 1904	$468.88
Total receipts by present Treasurer	$519.89
Total disbursements by present Treasurer	519.11
Balance on hand May 31, 1904	$ .78
Disbursements, as below:	
Printing of Bulletins and notices of meetings	$286.11
Rent of hall	210.00
Sundry expenses (collections, advertising, hire of lantern, etc.)	23.00
Total	$519.11

Outstanding accounts are fairly offset by uncollected dues of members, there being practically no surplus above running expenses.

Respectfully,

G. MAJOR TABER, Treasurer.

Report of Section of Astronomy for Year 1903-1904

The Section has held regular monthly meetings during the year, with fairly good attendance and excellent interest in the subjects presented for consideration.

The topics considered during the year have covered quite a wide range, including some that were purely astronomical, and others that were astro-physical.

The December meeting was of unusual interest, having been devoted to a symposium on the life and character of Herbert Spencer, participated in by several members of the Academy and by several scholarly gentlemen from without.

At the January and February meetings the Section was highly favored by the presence of Professor Hale of the Yerkes Observatory, who delivered most interesting and instructive lectures on the Sun, a subject on which he has become a recognized authority.

In connection with Professor Hale's work the Section congratulates itself and the Academy and the scientific interests of the community at large that the favorable conditions of our atmosphere have induced the authorities of the Yerkes Observatory to establish a station for solar study and observation on Mount Wilson.

This is an enterprise that appeals to the appreciation of every citizen but especially to that of the Academy of Sciences.

At the March and April meetings of the Section, the topics were in the field of pure mathematics, being respectively the principles and practical value of logarithms, the properties of the conchoid and of the cycloid curves and the method of trisecting an angle, all of which developed points of real interest to the members.

At the May meeting the Section enjoyed another rare treat in the presence of Bishop Warren of the Methodist Conference, a man of astronomical erudition and reputation, who made a delightful address before the Section.

The Section is greatly indebted to its energetic and capable Chairman for the well sustained interest in its monthly gatherings.

MELVILLE DOZIER, Secretary.

WM. H. KNIGHT, Chairman.

Annual Report of Section of Biology

I have the honor to make the following report of the work done in the Biological Section of the Academy for the year:

During the year ending June, 1904, the Biological Section has held nine meetings. The average attendance of the meetings has been about forty. The subjects discussed in these meetings are of such deep interest and are so creditable to the Section that I present you with a list of all of the formal lectures:

Dr. A. D. Houghton, "The Cactaceae."

Dr. Louisa Burns, "Blood Examinations and the Nissl Bodies."

Dr. C. A. Whiting, "Anemia and Leukemia and Ehrlich's Theory of Immunity."

Prof. Joseph Grinnell, "The Mid-Winter Birds of Los Angeles and the Geographical Distributon of Animals."

Dr. B. F. Gamber, "Malaria."

Dr. Lyman Gregory, "The Autogeny and Phylogeny of the Eye."

Prof. B. M. Davis, "The Larval Balanoglossus."

Dr. Leonard, "Some Bacilli Related to the Bacilli of Tuberculosis."

Aside from the formal lectures, which I have presented, there have been a great number of very interesting and valuable discussions.

At a considerable number of the meetings there have been exhibitions of microscopical preparations, some of them of deep scientific interest and others very interesting from a popular standpoint.

Every effort will be made next year to make the work of the Section of even greater value to its members and to the public than it has been in the past.

Very respectfully submitted,

C. A. WHITING, Secretary.

A. B. ULREY, Chairman.

Annual Report of Section of Geology for Year Ending June, 1904

The meetings have been well attended and much interest has been shown throughout.

September 28, 1903, Prof. Julius Koebig, city chemist, lectured on "The Deposits of Alkaline Salts" and their method of formation.

October 26, Mr. C. J. Callahan gave an interesting talk on the "Origin of Petroleum."

November 23, Prof. E. H. Fosdick favored us with a very instructive lecture on "Explosives, Their Manufacture, etc.," exhibiting samples.

December 28, President Theo. B. Comstock delivered a highly instructive and entertaining lecture on "Physical Geography and Geology of Brazil."

January 25, 1904, Mr. E. M. Wade gave a talk on "Radium," exhibiting the millionth part of a grain, and was followed by Dr. Arthur Houghton on "Radio-Activity of Metals."

February 22, Prof. Frank I. Shepard of University of California read a very interesting paper on "The Chemical Geology of Sedimentary Deposits."

April 25, Mr. G. Major Taber had a paper on "Mineral Formation and Crystalization," and exhibited several specimens. President Comstock followed, treating the subject from a scientific standpoint.

May 23, Ex-President Wm. H. Knight read an interesting poem on the Tribolite, and Mrs. Charles Nelson Green of Colorado gave a very interesting paper on the "Cliff Dwellers of the Southwest."

Owing to the inclemency of the weather, the meeting intended for March was necessarily postponed. We shall hope in the coming year to make all meetings of still more value and interest than they have been in the past.

G. MAJOR TABER, Secretary.

GEO. W. PARSONS, Chairman.

Publications Received.

"Some Miscellaneous Results of the Work of the Division of Entomology." Entomology Bulletin No. 44 U. S. Department of Agriculture.

"Carnegie Museum Annual Report, 1904." Pittsburgh, Pa.

"The Farm Separator." U. S. Department of Agriculture, Bureau of Animal Industry, Bulletin No. 59.

"The Southwest Society of the Archaeological Institute of America." "Something About Its Aims and Its First Year's Work."

"A List of the Publications of the U. S. National Museum." Smithsonian Institute Bulletin No. 51.

"A Fossil Egg From Arizona." University of California, Geology, Bulletin No. 19.

"Euceratherium, a New Ungulate From the Quaternary Caves of California." University of California, Geology, Bulletin No. 20.

"Report on the Habits of the Guatemalan Cotton-Boll-Weevil Ant." U. S. Department of Agriculture, Entomology, No. 49.

"The Useful Properties of Clays." U. S. Department of Agriculture, Circular 17.

"Methods for the Detection of Renovated Butter." U. S. Department of Agriculture, Circular 19.

"Parergones del Instituto Geologico de Mexico." Tomo I, No. 2, pp. 3-26, 3 Pl., 1904. I. "Notes on Physiography, Geology and Hydrology of Lower California." By Dr. Ernest Angermann. (Translation.) II. "Area Covered by the Eruption of the Volcano Santa Maria, October, 1902." By Dr. Emilio Boese. (Translation.)

"Annals of Carnegie Museum" (Pittsburgh). Vol. II, No. 4. August, 1904.

"Mining Magazine." New York, Sept., 1904. Vol. X, No. 3.

"American Journal of Archaeology." 2nd Ser. July-September, 1904. Vol. VIII, No. 3.

TRANSACTIONS

I. SESSIONS OF THE ACADEMY.

1. Academy Reception, June 6, 1904.

The Annual Reception of the Academy was held at the residence of Mr. S. J. Keese, 1509 Shatto street, on Monday, June 6, 1904, at 8 p. m.

The President of the Academy, Dr. Theo. B. Comstock, presided and Geo. W. Parsons was chosen Secretary pro tem in the absence of the regular secretary, Mr. Baumgardt.

The Treasurer presented his final report, which was received and filed after explanation of apparent differences between it and the report of the Secretary, due to closing at different dates.

Reports of the Sections of Biology, Astronomy and Geology were filed in writing by the respective secretaries after being duly read and received by the Academy. Dr. S. M. Woodbridge, Secretary of the Section of Agricultural Chemistry, also gave an interesting verbal report of the year's work.

All these Section reports show careful and patient work during the past year and increasing interest along the several lines of study and research, auguring well for the future of the Academy. Mr. Keese, the host, then gave an exhibition of Microscopic Projections of Crystals and other objects showing the beautiful effects of polarization, explanations being made at the same time by Dr. Whiting with physiological specimens and Professor Dozier of the principles of polarization, in very clear and interesting talks, they being followed by Dr. Comstock and Dr. Houghton, who also elucidated clearly and concisely some technical points.

A vote of thanks was then tendered Mr. Keese for his kindness and trouble in providing entertainment.

Dr. Theo. B. Comstock retired from his office as President of the Academy, in a few well chosen words, and Professor Dozier assumed the office with expressions of congratulation for work done faithfully and ably by the retiring president. Dr. Comstock responded, thanking all for the earnest and hearty support given him during his two years of administration. Dr. Whiting, in strong terms of praise for what Dr. Comstock had accomplished, proposed resolutions of thanks, to be spread upon the minutes and an engrossed copy sent to retiring president. Dr. Houghton heartily seconded the motion, which was carried unanimously, the resolutions to be drawn up by the movers thereof and duly presented.

The meeting then adjourned.

GEO. W. PARSONS, Secretary Pro Tem.

2. Regular Session, September 5, 1904.

The first general meeting of the Academy for the season of 1904-1905 was held at the Chamber of Commerce hall Monday evening, September 5, 1904, President Melville Dozier in the chair. It was addressed by Prof. Wm. H. Pickering, of the Harvard Observatory. He spoke of his recent observations of the moon, made in the clear skies and "good-seeing" atmosphere of the Lowe Observatory on Echo Mountain. He had detected what he believed to be evidences of activity and possibly of vegetable life on the moon. He noticed that, after the long lunar night of two weeks, small patches of white would turn to a grayish or brownish hue under the powerful rays of the sun in the long lunar day. Also that deep cracks or ravines—at first almost black—changed to a grayish tint and broadened out to a measurable extent. He accounts for the latter phenomenon by assuming that there is a little moisture beneath the surface in these localities, and that the heat of the sun melts the frozen crystals and instantly transforms them into vapor which rises to the surface and fills the depressions, broadening out to visibility.

Regarding the brown patches, he thinks there may be a low form of vegetation capable of quick growth and development, which would account for the slight change in color perceived from the vantage site of the Lowe Observatory, but also previously noticed at the Arequipa Observatory in the high Andes, over which Prof. Pickering presided for some years. Other astronomers have noted these lunar markings and their verity is now conceded, but there is not a perfect agreement as to their cause.

Referring to the so-called canals of Mars, Prof. Pickering believes they are caused by the same agency, but acting on a larger scale, and on a body in which the atmosphere and vapor are not wholly absorbed into the interior. He does not admit that there are any seas on the surface of Mars. But the canal appearance is produced by vapor being exuded from long, deep cracks and spread along the margin to such an extent as to make the phenomenon visible under good-seeing in our powerful telescopes.

Prof. Pickering's lecture was preceded by Secretary Baumgardt's account of an interesting gathering of astronomical workers on Mount Wilson. Prof. George E. Hale, Director of the Yerkes Observatory; Dr. Herbert H. Turner, Director of the Oxford University Observatory; Prof. G. W. Ritchey, Optician of the Yerkes Observatory, and Prof. Wm. H. Pickering of the Arequipa Observatory in South America were among the distinguished astronomers Mr. Baumgardt met on that occasion. They were on Mount Wilson inspecting the new instrument now being installed by Prof. Hale for furthering researches into the constitution of the sun. This instrument is a coelostadt, and the tube, five feet in diameter, is 145 feet in length, and imbedded in solid granite. The tube is horizontal and fixed, a large plane, movable mirror reflecting objects from every portion of the heavens into the tube where the image is magnified to any desired degree. The summit of Mount Wilson is 5886 feet above sea level and about thirty miles northeast of Los Angeles. It was selected from among many other sites examined as being the most suitable from which to conduct Prof. Hale's astrophysical investigations of the sun.

President Dozier announced that an arrangement has been effected with the Trustees of the State Normal School which gives the use of one of the halls to the Academy of Sciences for its general and section meetings on each Monday evening during the season of 1904-1905.

WM. H. KNIGHT.

II. MEETINGS OF SECTIONS.

No meetings of Sections are held in June. The Board of Directors, by advice of the Chairmen, on account of the difficulty of getting speakers and gathering audiences earlier than October, passed a resolution suspending the meetings of all Sections in September, also. Regular meetings will be resumed in October, at the State Normal School.

Section of Geology, April, 1904.

(Through inadvertence the following brief minute of the April meeting of the Section of Geology was omitted from the May Bulletin, the proceedings of the Section for May being substituted therefor.)

The regular meeting of the Geological Section was held at the Chamber of Commerce hall April 23d. In the absence of Chairman Parsons, Dr. Theo. B. Comstock presided. After the reading of an amusing poem on the Trilobite by Mr. Wm. H. Knight, the Chairman and Secretary introduced Mrs. Charles Nelson Green, Vice Regent of the Cliff Dwellers' Association of Colorado, who gave an interesting account of the Cliff Dwellers of the Southwest. With some reference to the various speculative theories of the origin of the Cliff Dwellers the speaker remarked that the once abundant foot prints in the arid lands of Colorado, Utah, New Mexico and Arizona of millions who once inhabited those regions have long since passed away. The traces of their occupancy are now to be found in the utensils, pottery and mummified remains which constitute, with the relics of their dwellings, their legacy to history. She described the evidences of their mode of life to be gleaned from pictures on the rocks and from remains of their homes sculptured out of the rocks or walled up tenements on the cliffs.

In the profitable discussion which followed, remarks were made by the speaker and by Mrs. C. R. Olney, Messrs. Knight, Butterworth, Comstock and others.

At the close of the meeting the officers of the Section, Mr. Geo. W. Parsons, Chairman, and Mr. G. Major Taber, Secretary, were re-elected to serve for the year 1904-1905.

G. MAJOR TABER, Secretary.

III. DIRECTORS' MEETINGS. (Not Previously Reported.)

The Board met May 13, 1904, at the Office of President Comstock, who occupied the chair. All members present except Mr. Hooker. Mr. M. R. Preston was elected to membership in the Academy. Mr. Geo. W. Parsons tendered his resignation as member-elect of the Board for the following year, and the same was accepted.

An earnest discussion followed on the prospects for a permanent home for the Academy. Dr. Woodbridge, who had previously been appointed a committee of one for this purpose, reported progress in the matter.

Voted that the Constitution and By-laws and list of members be printed in the next number of the Bulletin.

A number of bills were approved and ordered paid.

B. R. BAUMGARDT, Secretary.

The Board met at 1:00 p. m., June 4, 1904, at the Office of President Comstock, who presided. Report of previous Board Meeting, May 13, was read and approved. The report of Auditing Committee was received and referred back for adjustment of reports of Secretary and Treasurer to an equivalent date, as of June 1, 1904, in accordance with the Constitution, with instructions to audit the Treasurer's accounts and report at first meeting of the new Board.

Professor A. H. Chamberlain, of Throop Institute, of Pasadena, was elected to membership.

Upon motion of B. R. Baumgardt, voted that in the future all collections of membership dues and other resources of the Academy be attended to by the Treasurer, with the aid of the Assistant Treasurer, thus relieving the Recording Secretary of all responsibility for these collections.

Voted that the membership dues be hereafter pro-rated by the month, for the first year, of persons joining the Academy after the beginning of the fiscal year.

Adjourned sine die.

B. R. BAUMGARDT, Secretary.

Board met at Chamber of Commerce Committee Room on Tuesday, June 7, 1904, at 4:30 p. m. President Dozier presided. Present, Messrs. Comstock, Knight, Taber, Parsons and Baumgardt. To fill the vacancy in the Board of Directors caused by the resignation of Mr. G. W. Parsons, Dr. C. A. Whiting was unanimously elected.

Mr. Parsons, whose resignation had previously been accepted, is returned to the Board by virtue of his election as Chairman of the Section of Geology.

Mr. G. Major Taber was re-elected to the office of Treasurer of the Academy.

Voted that, unless the financial condition of the Academy be improved, the Bulletin shall be issued quarterly, beginning with the issue for October, 1904.

President Dozier announced the appointment of the Standing Committees, as provided by the Constitution, the Secretary being added to the Program Committee by vote of the Board at this meeting.

(See list of Standing Committees elsewhere in this Bulletin.)

Adjourned.

B. R. BAUMGARDT, Secretary.

Board met at Chamber of Commerce Committee room at 4:30 p. m., September 12, 1904. President Dozier presiding. All members present except Mr. Hooker.

President Dozier announced that the authorities of the State Normal School had granted permission to use such rooms as may be required on Monday evenings, for the meetings of the Academy and its Sections, the necessary expenses of such meetings to be paid by the Academy. The courtesy was gratefully accepted and an unanimous vote of thanks tendered. By vote of the Board the weekly meetings will hereafter be held at this place.

This disposing to some extent of the hindrance from lack of funds, it was resolved to continue the monthly issue of the Bulletin for the remainder of the calendar year, in the hope that enough interest may be aroused to enable the Publication Committee to continue the same monthly next year.

Mr. B. R. Baumgardt, Secretary of the Academy, was chosen as Delegate to the International Congress of Arts and Sciences to convene at St. Louis September 19-25.

A proposition of Dr. Davidson to recommend to the Academy a reduction in the amount of annual dues now assessed was discussed and made special order for the next meeting of the Board.

Voted that no meetings of Sections be held in the month of September this year.

Adjourned.

B. R. BAUMGARDT, Secretary.

Government Game Refuges*

BY ALDEN SAMPSON, A. M., HAVERFORD, PA.

(Read before the Academy Oct. 3, 1904)

The arguments here adduced are the result of personal observations and special studies made in a trip, aggregating some thirteen thousand miles, during the summer of 1903, while engaged in inspecting forest reserves of California and Washington for the purpose of selecting tracts to be set aside as refuges and breeding grounds, and to enable the representative of the Government to report intelligently on this general plan of Game Refuges.

The existing conditions are not conducive to the most satisfactory results in game preservation, so far as the control of public forest reserves is concerned. It is my own opinion that the Department of Agriculture, through its efficient Bureau of Forestry, should have the charge of the forest areas. The Land Office, a bureau of the Interior Department, is now in actual control of the reserves, although the Bureau of Forestry—a scientific, non-political body—is often supposed to be responsible for what it has no power to prevent. It should be clearly understood that, however free this department may be to act in certain directions, it cannot prevent depredations, the kindling of forest fires, or the destruction of game, except in very limited degree.

The idea of establishing game preserves, as such, is not new. In Europe, e. g. in Russia, Germany and Great Britain, certain wild animals have long been protected by governmental edict, not always from motives higher than the assurance of pastime for royalty or the maintenance of the chase among the gentry. Game laws are not rare in our several states, and to a certain extent, more especially with the smaller species, these are fairly effective hindrances to extinction of wild animals. In the case of big game, however, several causes have operated to distract attention of law-makers and public spirited citizens, who have rested secure in the belief that possible danger from excessive breeding is a convincing argument in favor of the "let alone" policy. Such persons could not have been aware of the ruthless slaughter which has been going on for decades past, and which has resulted in all but extinction of several types of the larger animals, such as the Bison, Grizzly Bear, Elk, Antelope and Mountain Sheep. Fortunately the refuge afforded by the Yellowstone Park has checked this devastation, at least in the cases of the bison, antelope and elk, and the experience thereby gained has taught good lessons for our future guidance.

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*The author of the paper of which an abstract is here given, was recently Game Preserve Expert in the U. S. Biological Survey.

Whether the control of the forest reserves shall pass to the Bureau of Forestry, or otherwise, there can be no more appropriate site for big game refuges than within these tracts. The same spirit which was the cause of reckless waste of wealth in timber, through forest fires and the grazing of sheep, is evident in the wanton destruction of hordes of game for the mere lust of killing, which is as far removed from sportsmanship as bloody war from the homely arts of peace. But the craft of the hunter is now more sorely taxed by the cleverness of the hunted, who have come to know their danger and to flee from it. It is surprising how quickly the pursued learn to realize the safety of the refuge tracts. This fact disposes of all the force there might be in the argument that the reservation of such protected areas will destroy the rightful hunter's privilege, and require the segregation of vast areas of unproductive territory.

From careful observation and experience elsewhere, it is now very apparent that the best results will come from small refuges, say about four townships, or twelve square miles, scattered with considerable intervals intervening.

There is far more immediate danger, and greater future menace to vested interests and the progress of civilization, in the threatening devastation by tame sheep than could ever arise from undue multiplication of the most ferocious wild animals. As a matter of fact, bears and mountain lions do not attack man unless wounded. Sheep do untold injury by browsing on the short vegetation, nibbling close enough to kill; by destroying the young forest growth, the future dependence for all forest products of value; their sharp hoofs cut out the roots of grasses and grind the soil to dust, which is washed off by rains. In this way untold damage ensues, not only to the forests, but to the farms in the valleys, which depend upon the undergrowth of these forests to retain the water for regularity of distribution.

California's—nay the world's—greatest living prose poet, beloved John Muir, has stated that every great public issue of a similar nature requires about ten years of unswerving devotion from its votaries before it may become an accomplished success. We can wait, therefore, not without hope, for already the sentiment, which first bitterly opposed the work at hand, is changing enough to ensure respectful hearing. I thank you cordially for the support you have given by your attention and sympathy upon this occasion.

Flora of Clifton District, Arizona

BY A. DAVIDSON, M. D.

(Paper read before Section of Botany Oct. 18, 1904)

In due course of time some enterprising botanist will give us, if not a flora, at least a local list, of the plants of Arizona.

Arizona possesses probably the most interesting and varied flora of any state in the Union. Many of its plants are considered rare and local, but this rarity is probably more apparent than real. The greater part of the country is practically unknown to the naturalist and many years must elapse before the work of exploration is even superficially performed.

The lack of facilities for travel and accommodation are the least of the difficulties. The climatic conditions are the deterrent factors. Contrary to the usual belief, Arizona is by no means an arid country. The average rainfall, even in the south, is probably at least seven inches and in the north it is more. The greatest precipitation is normally in the summer time, beginning with the 1st of July and ending the end of August, or middle of September. The winter's snow or rainfall appears in January and December. Thus there are two floras, contingent on the rainfall in spring and autumn. To thoroughly explore any district the same ground would require visiting after each rain, but the summer rains are so unequally distributed that a locality explored one spring might not receive sufficient summer rain for the two or three seasons following.

Last autumn I visited Chase Creek and found it practically destitute of vegetation, while the country ten miles away was a carpet of green. These experiences are common. As you go botanizing in the summer time, with the thermometer around 90 degrees at midnight, you clothe yourself in a silk shirt and a pair of duck trousers and pray for rain, and when it catches you on some rocky slope or treeless plain in the form of a cold, drenching thunderstorm you pray again for warmth. Altogether the conditions are not favorable to good and philosophic work.

As many years are likely to elapse before the country is sufficiently closely explored to give a clear idea of the distribution of its numerous species, any list of plants now published will prove of immense value to future investigators.

In this number I have begun the publication of the plants secured by me in the neighborhood of Clifton. The district covered extends from the New Mexico border near Duncan, twenty-five miles south of Clifton, to the Blue River, a tributary of the Frisco, nearly twenty miles north of Clifton, and west along Chase Creek for twelve miles. The River Frisco, with its tributaries, traverses the district, as it flows southwards to join the Gila about twelve miles below Clifton.

LIST OF PLANTS.

Anemone sphenophylla Poepp. Clifton. Longfellow. April.

Aquilegia chrysantha Gray. Moist banks Chase Creek and Blue River. May.

Thalictrum Fendleri Eng. var. **Wrightii** Trealease. Metcalf. July.

Clematis Drummondii T. & G. Fairly common. September.

R. cymbalaria Pursh. Gila River at Guthrie. May.

Myosorus minimus L. River at Clifton. May.

Eschscholtzia Mexicana Greene. Common. May.

Corydalis aurea Willd. var. **occidentalis** Eng. Frequent along shaded river banks.

Wislizenia refracta Eng. On the Gila banks at Sheldon. October.

Cleome integrifolia T. & G. Locally abundant in sandy soils. May.

Polanisia trachysperma T. & G. Widely distributed May to October.

ASTRONOMICAL NOTES.

EDITED BY WM. H. KNIGHT.

The new instrument which is being installed on Mount Wilson by Director Hale of the Yerkes Observatory, will be known as the Snow Memorial Telescope, and is the largest of the kind in the world. This is made possible by the liberal contribution of Miss Snow in connection with an appropriation of $13,000 from the Carnegie research fund. In connection with this great instrument there will be spectographs, spectroheliographs, and the finest astronomical apparatus possible to obtain. It is expected that it will be ready for research work in December of this year, and will be used in observing the phenomena of sunspots and solar disturbances during the maximum sunspot year of 1905.

Regarding the possibilities of this research work Professor Hale says: "The solar observer may be the spectator of physical and chemcial experiments on a scale far transcending any that can ever be performed in a laboratory. In this enormous crucible, (the sun), heated to temperatures greatly exceeding those attainable by artificial means, immense masses of luminous vapor, including most of the elements known on earth and many not yet discovered here, may be seen undergoing changes and transformations well calculated to assist in the explanation of problems which the laboratory cannot solve."

An important astronomical event is the return of Encke's comet under favorable conditions for observation, similar to those of 1805, 1838, and 1871. It will be at perihelion January 4, 1905. Its nearest approach to the earth will be about 35,000,000 miles, when, early in December, it may be visible to the naked eye near the star Altair. It will be five degrees north of Beta Pegasi on November 1, its course being westward.

Sir David Gill of the Royal Observatory at Cape Town has determined the parallax of the star Antares as 0.021 sec., making its distance in round numbers one quadrillion miles. From photometric considerations J. E. Gore computes the mass to be 88,000 times that of our sun. ''If,'' says Prof. Edgar Larkin, ''its density is equal to that of our sun, the diameter of that stupendous world would be 37,000,000 miles, or about equal to the radius of the planet Mercury.''

There is confirmaton of the existence of a ninth satellite revolving around the mighty system of Saturn, far out in space beyond all the satellites of that body hitherto known. It was discovered by the photographic method, by Professor Wm. H. Pickering, with the Bruce 24-inch telescope at Arequipa, Peru. This new moon has been given the name of Phoebe by its discoverer.

ANNOUNCEMENTS FOR OCTOBER-NOVEMBER, 1904.

Many members of the Academy were enabled to enjoy the illustrated lecture of Mr. Alden Sampson at the Woman's Club House, on Friday evening, September 30, through the courtesy of the Friday Morning Club and the local section of the Sierra Club, by whom the invitations were given.

We have also to express thanks to the Ebell Club for their esteemed invitation to the Academy to join with them in welcoming Sir John Murray, who was expected at their meeting on Monday afternoon, October 11. We share their regret at the contretemps which delayed their distinguished guest, depriving all of delectable and profitable entertainment. But later, upon the arrival of Sir John in the city, it became possible to arrange a joint meeting of the Ebell and the Academy at the State Normal School, when the lecturer aroused much enthusiasm by his very interesting and important address upon the subject of ''Oceanology.''

The Section of Biology met Monday evening, October 10, at the Normal School, the program being varied and of the nature of general discussion upon current topics. These occasions are always profitable to members and others who attend.

The Section of Botany met October 18, 8 p. m., at Room 501, Laughlin Building. Dr. Anstruther Davidson spoke on ''The Botany of Arizona,'' to which he has given particular attention in the field. We are able to give an abstract of his paper in this issue of the Bulletin.

The regular session of the Section of Geology will take place at the Normal School, Monday evening, October 24, when Mr. J. B. Lippincott, supervising engineer of the Reclamation Service of the U. S. Geological Survey, for this district, will outline the work of his division. Nothing can now occur of more general interest or importance to the welfare of this community, and we bespeak for him a large attendance of members and their friends.

The Academy will have a lecture on the evening of November 7, by Dr. Theo. B. Comstock, on the subject: ''Wild Nature in the Rocky Mountains, Around and About Yellowstone Park,'' illustrated by lantern slides, mostly colored. Dr. Comstock was the geologist of Capt. Wm. A. Jones' Expedition in 1873, which discovered four passes not previously recorded on any map, among them two which had been pronounced mythical theretofore. The lecturer has collected a large number of views of remarkable and very little known scenery and natural groups of wild animals, many of which cannot be duplicated.

The several Sections are preparing interesting and profitable programs for November, but we go to press too early to give details in this place.

RECENT LITERATURE.

The Annual Report of the Carnegie Museum, Pittsburgh, for the year ending March 31, 1904, possesses interest to us in Southern California in several ways. First, it shows what can be done by enlightened public spirit assisting and assisted by donations from those who have the good sense to appreciate the prime value of scientific work and museum collections as educational and refining influences. Secondly, it adds to our discredit for the meager accomplishment here, by disclosing the purchase of A. W. Anthony's collection of ten thousand birds of the Pacific Coast, taken out from under the noses of local men of money. But still more, we have let go to this same museum a valuable collection of plants from Southern California, sold by Professor H. M. Hall, of Berkeley. Thirdly, it stands as an example of what opportunity lies open to us, if only we can get together funds enough to make a decent start in conserving what is near to our hands. The experience of the Southwest Society of the Archaeological Institute of America, in simply **pushing** to the front clearly indicates that ripe fruit needs plucking here in Los Angeles, and the harvest awaiting the reapers of the Academy of Sciences is far more abundant than many of us realize. **"Let us then be up and doing."** **(C.)**

"A Fossil Egg From Arizona" is the title of a paper by Wm. Conger Morgan and Marion Clover Tallman, issued as Bulletin No. 19, Vol. 3, of University of California Publications. The specimen was found embedded in a pebble picked up from gravel on the Gila River. Its age, though not absolutely determinable, was probably as old as the Quaternary (Pleistocene) Period. The markings of the shell and the interior structure are well preserved, and the condition of the contents affords proof of actual transformation of animal tissue into bituminous matter. The bulk of the inner space is filled with the mineral, colemanite, with small patches of a tarry substance closely allied to the petrolene series of natural asphalts. The authors fairly demonstrate the impossibility of external origin of the tarry ingredient. **(C.)**

Bulletin No. 20, Vol. 3, of University of California Publications, is a paper on "Euceratherium, a New Ungulate From the Quaternary Caves of California," by Wm. J. Sinclair and E. L. Furlong. This discovery in places in Shasta county, is interesting to technical students, who will see in it a link in the chain of ancestry of an important group composing the Sheep Family. The name, signifying beautiful-horned wild beast, is taken from the gentle curve of the horns, which are smaller than those of the Bighorn Mountain Sheep, although the head was larger. **(C.)**

"The Useful Properties of Clays," by Allerton S. Cushman, appears as Circular No. 17, Bureau of Chemistry, of the U. S. Department of Agriculture. The intimate relation of clays to progress in civilization, the backwardness of America in the fashioning of works of art and beauty from this material, and the lack of any cause therefor except indifference of the people, are briefly presented. Then follows an explanation of the reasons for the prestige attained by certain potteries and the final passage of celebrated wares into the domain of the lost arts, mainly because of very slight differences in chemical composition of the materials used. Every deposit of clay is a problem by itself and men skilled in the working of one grade may be entirely at a loss how to manipulate another which differs only in minute particulars. The clays of the United States are as diverse and as well adapted to the production of art pottery and fine porcelains as those of Europe; and yet in 1902, 11.5 per cent. in bulk and over 56 per cent. in cost, of all clays used in this country were imported.

Mr. Cushman gives valuable information on varieties, physical properties, treatment, uses and methods of testing. Eighty-eight modes of use are given, on the authority of the U. S. Geological Survey, and the list quoted does not comprise all that might be mentioned. **(C.)**

"Informe Acerca de la Fisiografia, Geologia e Hidrologia de los Alrededores de La Paz, Baja California, por Ernesto Angermann, Dr. Phil." 1904. 26 p. This document forms the first paper of Vol. 1, No. 2, of the Transactions of the Instituto Geologico of Mexico. It contains a map made up from the previous work of Dr. Gustav Eisen, the Instituto Geologico and the imperfect railway maps in the Mexican Official Guide, with corrections and additions by the author. Upon a tracing sheet superimposed the geological terranes are outlined. Interesting facts regarding the topographic divisions, water supply, etc., of the southern portion of Lower California are given. **(C.)**

"The Southwest Society of the Archaeological Institute of America; Something About Its Aims and Its First Year's Work. Mr. Chas. F. Lummis, tireless worker; faithful, persevering and efficient Secretary of the local branch of this great scientific body; indefatigable, versatile and consistent recorder and elaborator, has, in this illustrated reprint of an article from Out West, entitled "Old Art in America," given the history of the priceless Cabelleria collection of old Mission paintings, now preserved through the efforts of the Southwest Society. The Executive Committee of this young, but virile organization has sent this out as a campaign publication, adding thereto a "Brief Summary" of the first year's work of the Society. The thorough work being done in the phonographic recording and the harmonizing of Indian and Mexican folk-songs, by Messrs. Farwell and Lummis, the vigorous and scientific labors of Dr. F. M. Palmer, the most modest, but most competent of local archaeologists, in collecting and arranging relics of earlier man in this region, and the advanced stage of progress in the plans of the Exeecutive Committee towards the erection of a Museum in Los Angeles; all these and other accomplishments of the Society in much less than one year are grounds for great local pride. But when it is understood that no other branch of the Institute has ever accomplished anything like this amount of work in twice the same time, we are strongly admonished that the Southern California Academy of Sciences must look to its laurels at once. If heretofore, we have not believed enough in ourselves and have been too self-confident of the worth of our aims, let us now pursue a more aggressive policy and compel the attention of those who now neglect their abundant opportunity to put where they rightfully belong the potent factors for good in this community.

The Quarterly issue of the Journal of the Archaeological Institute of America, Vol. VIII, No. 3, is replete with details of discoveries in classical archaeology by the American schools at Athens and Rome, maintained by the Institute, and voluminous discussions of archaeologic questions, besides numerous notes of recent work all over the world. These invaluable records are presented in good form and they add one more to the long list of contributions to archaic science made by this vigorously active organization.

"El Area Cubierta por la Ceniza del Volcan de Santa Maria, Octubre, 1902," by Dr. Emil Boese, is the second paper of Vol. 1, No. 2, of Transactions of Instituto Geologico de Mexico. He scores Dr. Gustav Eisen for remarks regarding the distribution of ash by this volcano in Guatemala in the eruption cited. In the region visited by the author, where Eisen had given the depth from one inch to ten feet, Dr. Boese finds a maximum of less than one foot, and in other places cited as important, the covering varied from traces to considerably less than one-half inch (less than one centimeter.) **(C.)**

"Annals of Carnegie Museum, Pittsburgh." Vol. II, No. 4, August, 1904, contains article No. IX, and an appreciative memorial sketch of John Bell Hatcher, whose death leaves a gap which no other student of vertebrate paleontology can essay to fill. The sketch is by Dr. W. J. Holland, Director of the Museum and Editor of its publications. The bulk of the volume is made up of an exhaustive treatise on **"The Birds of Erie and Presque Isle, Erie County, Pennsylvania,"** by W. E. C. Todd. We cannot give space for a proper review of this important contribution to Science, but may note the strong tone of protest uttered by Mr. Todd against indiscriminate hunting, rather slaughter, of birds, which occurs in his field as in too many other districts in this country.

Mining Magazine, September, 1904. The continuation of the Pacific Coast Miner as a monthly magazine is evidently meeting with favor, if we may judge from the increased advertising patronage in this third number under the new form. The articles are timely reviews by appropriate authorities on subjects interesting to those who cannot digest more technical treatises for lack of time or preliminary training. For busy engineers and others who need access to such technical articles, without leisure or facilities for assorting from the mass of literature published, a very complete mining index is given each month. This, and the able Mining Digest, which constitutes a regular department, furnish just what is required by amateur and professional in order to keep abreast of the world's work in the mining field. The first issue, in July, was excellent, but improvement may be detected in each succeeding output.

(Incorporated March 21, 1902)

CONSTITUTION AND BY-LAWS

(Adopted October 6, 1902)

CONSTITUTION

ARTICLE I.

NAME AND OBJECT.

SECTION 1. The name of this Association shall be Southern California Academy of Sciences.

SEC. 2. The objects of the Academy are:

(1) To promote intercourse among those who are cultivating science; (2) to elicit public interest in the results of technical investigation by the dissemination of correct information relating thereto; (3) the study of local natural features and phenomena; (4) the conservation of material illustrating local phases.

ARTICLE II.

MEMBERSHIP.

SECTION 1. The membership of the Academy shall consist of Active, Affiliated and Corresponding Members, Fellows, Patrons and Honorary Members.

Honorary Members shall be chosen with life tenure, they shall be exempt from the payment of dues and shall receive the publications of the Academy, but shall not be entitled to vote or to hold office.

Active Members and Fellows shall have the right to vote and hold office, subject only to the restrictions imposed by this Constitution, and they may acquire life tenure in their respective classes under the provisions of this Constitution. Patrons and Honorary Members shall be chosen with life tenure, and Corresponding Members may be elected with limited tenure or life tenure at the option of the Board of Directors.

SEC. 2. Any person living in California, south of Latitude 37°, may become an Active Member of the Academy upon subscribing to this Constitution, after formal election as herein prescribed, and due compliance with the By-laws in force at the time of election.

SEC. 3. All duly qualified members, in good standing, of any affiliated local society shall be enrolled as Affiliated Members of the Southern California Academy of Sciences.

SEC. 4. Corresponding Members may be elected (with limited tenure or life tenure) from duly qualified persons, non-resident in Southern California, in the same manner as provided for the election of Active Members of the Academy.

SEC. 5. Fellows shall be chosen from among the Active Members and Affiliated Members of the Academy, as provided in Article III, Section 3, of this Constitution.

SEC. 6. Any person contributing in any one year the sum of Five Hundred Dollars shall be classed as Patron, with all the privileges of a Life Member. Should such patron be at the time a Fellow of the Academy, the status shall become that of Life Fellow.

SEC. 7. Honorary Members may be elected from outside the membership of the Academy, in manner prescribed in Article III, Section 4, of this Constitution.

SEC. 8. Life Members and Life Fellows shall be such as may commute by the payment of Fifty Dollars at one time, which payment shall exempt from all dues thereafter during life, with all privileges appertaining to the class to which the member or fellow then belongs.

ARTICLE III.

ELECTION OF MEMBERS.

SECTION 1. Candidates for Active Membership shall be proposed by two members, in writing, and all such proposals shall be acted upon by the Board of Directors. The names of elected members shall be announced at the first regular meeting of the Academy following election.

SEC. 2. Corresponding Members shall be elected by the Board of Directors. The names of those so elected shall be announced at the first regular meeting of the Academy thereafter.

SEC. 3. Fellows may be elected by the Board of Directors in virtue of their scientific attainments or services. All such elections shall be by ballot and seven affirmative votes shall be necessary to elect. Only Active Members and Affiliated Members shall be eligible for election as Fellows. *Provided, however, that all Active Members enrolled prior to October* 1, 1902, *shall have the option to become Fellows, without formal election, not later than November* 15, 1902, *upon compliance with the other provisions of this Constitution and of the By-laws in force at the date of exercising this option.*

SEC. 4. Honorary members may be elected at the annual meeting of the Academy, by unanimous vote of the members present at said meeting. If the vote be not unanimous, the matter shall be at once referred to the Board of Directors for final action.

ARTICLE IV.

WORKING SECTIONS.

SECTION 1. There may be organized, as occasion warrants, separate working sections, corresponding in scope to individual branches of science. Each section shall elect its own officers and conduct its scientific work, *per se,* subject to the limitations of the Constitution and By-Laws and the supervision of the Board of Directors. All legislative acts passed by any Section shall be inoperative until formally approved by the Board.

SEC. 2. No Section shall be formed without petition presented at a regular meeting of the Academy, signed by at least five members, of whom not less than three shall be Fellows. Such petition shall be read before the Academy and referred to the Board of Directors for action.

SEC. 3. Upon authorization, as provided in Article IV, Section 2, the President and Secretary of the Academy, as temporary officers of the proposed section, shall call a meeting of members interested and proceed to organize the section in manner following:

1. Calling Meeting to order.
2. Reading of Petition and Minutes relating to same.
3. Signing roll by organizing members.
4. Election of Chairman and Secretary.
5. Formal announcement of organization.

Upon organization, the Section shall adopt a set of By-Laws in no way conflicting with the Constitution and By-Laws of the Academy, which shall thereupon be submitted to the Board of Directors for approval. When so approved and attested by the President and Secretary of the Academy, the Section shall be regarded as fully established on equivalent basis with any and all other Sections of the Academy.

SEC. 4. All members and Fellows of the Academy shall be free to unite with any or all Sections and no Section shall admit to voting privileges any non-member of the Academy.

ARTICLE V.

AFFILIATED SOCIETIES.

SECTION 1. Any local scientific society within the limits prescribed in Article II, Section 2, may enter into affiliation with the Academy, upon the terms and in manner prescribed in the succeeding sections of Article V of this Constitution.

SEC. 2. Application for affiliation must be made by the President and Secretary of the society, upon a blank form authorized by the Board of Directors, giving evidence that the application is made in accordance with the vote of a clear majority of the members of said society, and that the objects and purposes of the society are similar to those of the Academy. Each application must be accompanied with a fee of five dollars.

SEC. 3. Application for affiliation shall first be referred to the Standing Committee on Affiliation, who shall investigate and report to the Board of Directors. Notice of favorable action by the Board shall be given at the first regular meeting of the

Academy thereafter, and such action shall be regarded as final, unless objection be raised by at least two members, when the question shall be at the disposal of the Academy by a vote of not less than two-thirds of all the members present.

SEC. 4. Societies affiliated under the provisions of the three foregoing sections of this Article V, shall contribute annually in advance to the treasury of the Academy a sum equivalent to one dollar for each and every voting member of said affiliated society, whereupon that number of persons shall be enrolled as Affiliated Members of the Academy, with all the privileges of Active Members, except the right to vote and hold office. For each additional member thus enrolled, the sum of one dollar must be paid at the date of enrollment.

ARTICLE VI.

OFFICERS.

SECTION 1. At the annual meeting of the Academy and at the annual meetings of Sections, there shall be elected a Board of eleven Directors, in manner following:

The Academy shall elect three Fellows to serve as President, Vice President and Secretary of the Academy, respectively, and as many more Directors (from the Active Members or Fellows) as may be required to complete the number of eleven, after allowing one representative from each established Section of the Academy. Each Section shall then elect from among the Fellows thereof, a Chairman, who shall be the accredited representative of the Section on the Board of Directors. But, should any Chairman of a Section be already a member-elect of the Board of Directors, then the Section shall elect another representative on the Board of Directors from its own membership. Provided that the eleven Directors elected by the Academy in May, 1902, shall serve until the expiration of their respective term in 1903.

SEC. 2. The financial and general business transactions of the Academy shall be entrusted to the Board of Directors, who shall have the care and control of all real and personal property and shall receive, disburse and invest all funds of the Academy by drafts drawn on the Treasurer by the President and countersigned by the Secretary.

SEC. 3. At the first meeting of the Board of Directors a Treasurer shall be chosen from the members of the Board, whose duty shall be to receive and disburse all funds of the Academy in accordance with the provisions of this Constitution and the instructions of the Board of Directors.

ARTICLE VII.

ELECTION OF OFFICERS.

SECTION 1. Annual elections of officers and Directors shall be held on the date of the annual meetings of the Academy and its Sections in the month of May, by method prescribed in the By-Laws, and the administrative officers shall be installed at the annual meetings of the Academy and Sections in June following. The incoming Board of Directors shall assume control immediately on the adjournment of the June meeting, and the officers-elect of Sections shall be duly installed at the June meetings of their respective Sections.

SEC. 2. Election of officers and Directors of the Academy shall be by ballot, after nominations duly made as herein provided, viz:

Any person entitled to a vote may nominate, in writing, not later than March 30th, one candidate for each position to become vacant. The names of all candidates so nominated shall be duly considered by the Board of Directors, who shall then freely nominate an official ticket, which shall be presented at the April meeting of the Academy, together with such other names as shall have been regularly nominated by not less than ten Active Members and Fellows. The ticket, or tickets, thus announced shall constitute the formal nominations, to which the voting at the May meeting must be confined.

SEC. 3. Nominations and elections of the officers of individual Sections shall be in accord with the By-Laws governing the particular Section at the time.

SEC. 4. A vacancy occurring at any time in the Board of Directors shall be filled by the remaining members thereof for the unexpired term; should, however, such vacancy leave any Section without representation on the Board, the Section thus excluded shall elect one of its own members to serve as Director. Vacancies occurring among the officers of the Academy shall be filled by the Board of Directors from its own number.

SEC. No person shall be eligible for re-election to the office of President within one year after having served two consecutive terms.

SEC. 6. The Chairman of a Section shall be chosen from the Fellows on its membership roll.

ARTICLE VIII.

AMENDMENTS, ETC.

SECTION 1. Alterations of this Constitution, amendments thereof, additions thereto, or repeal of any portion thereof, may be made at any time, by a vote of two-thirds of the Members and Fellows of the Academy; provided, that the changes proposed be presented in writing at a meeting of the Academy, and that the vote be taken at a subsequent meeting, held not less than one month later.

BY-LAWS

ARTICLE I.

MEETINGS.

SECTION 1. Regular meetings of the Academy shall be held on the first Monday evening of each calendar month, except July and August.

SEC. 2. Regular Section meetings may be held monthly, at such times and places as shall be authorized by the Board of Directors, without whose formal consent no change shall be allowed. Special meetings and field meetings may be arranged by the Sections without reference to the Board, but they shall be reported in advance to the General Secretary, for the information of the Board.

SEC. 3. As far as practicable, the Board of Directors shall provide for meetings of the Academy and of the principal Sections at one and the same place.

SEC. 4. Special meetings of the Academy may be called by the President, and shall be called at the request of five members, provided that the particular business to be transacted be stated in the call, and that no other business be consummated at such special meeting.

SEC. 5. Special meetings of any Section may be called by the Chairman thereof, and shall be so called at the request of three members. The special business for said meeting shall be stated in the call, and no other business shall be transacted at said meeting.

SEC. 6. Advice of special meetings of the Academy shall invariably be given to all persons entitled to vote, by written or printed notices, duly mailed, not less than one week in advance of the date thereof.

SEC. 7. Annual meetings of the Academy shall be held in the place of the regular May meeting of each year.

ARTICLE II.

ORDER OF BUSINESS.

SECTION 1. The order of procedure at regular meetings of the Academy shall be:

1. Minutes of preceding meeting.
2. Report of Board of Directors.
3. Report of Committees.
4. (Special business.)
5. Unfinished business.
6. New business.
7. *Program for the Meeting, with discussions.*
8. Adjournment.

SEC. 2. At regular meetings of Sections the order of procedure shall be:

1. Minutes of preceding meeting.
2. Business of the Section.
3. *Presentation and Discussion of Papers.*
4. Enrollment of Members.
5. Adjournment.

Sec. 3. At each June meeting of the Academy the order of procedure shall be:

1. Brief statement of Plan and Scope of the Academy by the President.
2. Annual Reports of Secretary and Treasurer.
3. Announcement of donations.
4. Election of Honorary Members.
5. Necrology.
6. Program prepared by the Board of Directors, including installation of President elect and incoming officers.
7. Address by retiring President.
8. Dismissal by President-elect.

ARTICLE III.

QUORUM, ETC.

Section 1. Fifteen members shall constitute a quorum for the transaction of business at regular and special meetings of the Academy, provided that not less than five Fellows be included.

Sec. 2. Five members present shall constitute a quorum of the Board of directors for the transaction of business not otherwise restricted by the Constitution.

ARTICLE IV.

COMMITTEES.

Section 1. There shall be the following Standing Committees of the Board of Directors:

1. Committee on Publication.
2. Committee on Finance.
3. Committee on Membership.
4. Committee on Affiliation.

Sec. 2. The Committee on Publication shall supervise all publications of the Academy, subject to the control of the Board of Directors. No paper shall be published until after being read, in person or by title, before the Academy or one of its Sections. The Chairman of the Publication Committee shall be the Editor of the Bulletin and other regular publications issued under the authority of the Academy.

Sec. 3. The Committee on Finance shall act in an advisory capacity on matters affecting the appropriation and expenditure of funds and the application of grants, donations and bequests, and its members shall also perform the duties of an Auditing Committee, reporting at the Annual Meeting of the Academy upon the condition of the books of the Treasurer.

SEC. 4. The Committee on Membership shall be charged with the duty of enlisting suitable members by all appropriate means.

SEC. 5. The Committee on Affiliation shall investigate all applications for affiliation and report to the Board of Directors before final action thereon. It shall be the duty of the Committee to co-operate with the President in appropriate efforts to extend the influence of the Academy among local societies, and to induce such bodies to become affiliated with the Academy.

SEC. 6. There shall be a Standing Committee on Program, to consist of the President and the Chairmen of all the Sections, whose duty it shall be to arrange suitable programs for all regular meetings of the Academy, under such regulations as may be prescribed by the Board of Directors.

ARTICLE V.

DUES AND FEES.

SECTION 1. Each active member, upon election, shall pay an initiation fee of One Dollar.

SEC. 2. Each active member, upon changing status to Fellow, shall pay a Fellowship fee of One Dollar.

SEC. 3. Annual dues of Active Members and Fellows, shall be Three Dollars, payable January 1st, in each year.

SEC. 4. Special dues assessed by any Section, in addition to the established dues of the Academy, shall not exceed One Dollar per annum. All such dues shall be covered into the Treasury of the Academy and applied solely to the current expenses of the individual section, unless otherwise especially authorized by the Board of Directors.

ARTICLE VI.

ELECTION OF OFFICERS.

SECTION 1. On the day of the annual meeting, polls shall be established as near as may be to the regular meeting place of the Academy, which polls shall be open not less than two hours prior to the hour set for the meeting. The President shall appoint three judges of election to supervise the voting and three tellers to count the votes. All these appointees must be selected from without the Board of Directors, and no person who is a candidate for any office at such election shall be eligible as judge or teller aforesaid.

ARTICLE VII.

ADOPTION OF BY-LAWS AND AMENDMENTS THERETO.

SECTION 1. By-Laws for the further regulation of the Society may, from time to time, be made, and any By-Law or portion thereof, may be temporarily suspended by vote taken at a regular meeting of the Academy, two-thirds of the members present concurring; but such act shall not be operative unless the names of ten Fellows present are recorded in the affirmative.

List of Members

HONORARY MEMBERS.

Coleman, S. E.	Oakland, Cal.
McClatchie, Professor A. J.	
Montgomery. J. J.	Santa Clara, Cal.
Parish, S. B.	San Bernardino, Cal.
Swift, Lewis, Ph. D.	

LIFE MEMBERS AND FELLOWS.

(Fellows are designated by the sign *).

*Comstock, Dr. Theo. B.	Stimson Bldg.
*Hendryx, W. A.	Douglas Bldg.
*Hooker, J. D.	325 W. Adams St.
*Watts, W. L.	146 W. 28th St.

ACTIVE MEMBERS AND FELLOWS.

Adams, A. G.	906 W. 7th St.
Allin, T. D.	Pasadena
*Arnold, Paul	1111 South Hope St.
Avery, Wm. H.	Laughlin Bldg.
*Bailey, Dr. C. A.	10th St. and Flower
Baker, Professor C. T.	Claremont
Bannister, L. H.	Station A, Pasadena
Barlow, Dr. W. Jarvis	Wilcox Bldg.
Barnum, Dr. O. S.	Stimson Bldg.
Barrows, H. P.	Ontario
*Baumgardt, B. R.	116 N. Broadway
Baverstock, Ralph S.	322 W. First St.
Beals, Professor Frederick H.	615 W. 5th St.
Behrens, H. A.	Conservative Life Bldg.
Behrens, R. H.	Conservative Life Bldg.
Behymer, L. H.	Mason Opera House
Benton, Arthur B.	114 N. Spring St.
Berman, Mrs. R.	1689 W. Adams St.
*Bishop, Dr. H. M.	2627 Hoover St.
*Bobrick, G. A.	727 San Fernando St.
*Boothe, Chas. B.	824 Bonnie Brae St.
*Borden, Gail	508 Laughlin Bldg.
Boyle, J. L.	507 Carondolet St.
*Brackett, Professor F. P.	Pomona College, Claremont
*Bridge, Dr. Norman	217 S. Broadway
Brigham, Olivia S.	401 Court St.
Brittain, E. A.	417 W. 7th St.
Brown, Frederick L.	Garvanza
*Bullard, Dr. F. D.	Bradbury Bldg.
Burcham, Mrs. C. A.	700 Burlington Ave.
Burns, Dr. Louisa	S. Pasadena
*Butterworth, W. A.	Pasadena
*Cady, Dr. Jessie A.	10th and Flower Sts.
*Callahan, C. J.	127 N. Main St.
*Canfield, Wm. J.	Johnson Bldg.
Chamberlain, Professor A. H.	Throop Inst., Pasadena
*Chamberlain, J. F.	Normal School
Chandler, Harry	Times-Mirror Co.
Chapin, Dr. A. R.	Altadena
Chase, Lucius K.	Laughlin Bldg.
Cheney, Hon. W. A.	Stimson Bldg.
Cheney, H. D.	Stimson Bldg.
Clark, J. M.	152 Lake Ave., Pasadena
*Claypole, Dr. Edith J.	Pasadena

Cole, Dr. Geo. L.	1425 S. Hope St.
Coleman, S. E.	Oakland
Collins, H. O.	Henne Bldg.
Colwell, W. A.	105 W. 5th St.
Comer, J. A.	Laughlin Bldg.
Conaty, Rt. Rev. Thomas J.	717 S. Burlington Ave.
Conrad, Dr. A. C.	454 S. Spring St.
Cook, J. A.	Currier Bldg.
Cooper, Alice G.	202 W. 27th St.
Crosswell, Profesor T. R.	Normal School
Crow, Geo. R.	Conservative Life Bldg.
Crow, Dr. Louise P.	676 Westlake Ave.
Cunningham, D. W.	627 W. 18th St.
Cuzner, James	California Club
*Davidson, Dr. Anstruther	Laughlin Bldg.
*Davis, Dr. H. J.	2 Chester Place
*Dozier, Professor Melville	State Normal School
Durand, D. L.	509 W. 23d St.
Eddy, J. W.	Bryson Bldg.
Elliott, J. M.	First National Bank
Emery, Dr. R .D.	10th and Flower Sts.
Fargo, Dr. J. F.	139 W. Adams St.
*Fellows, Dr. Alfred	929 S. Main St.
Fishburn, J. E.	2827 Menlo Ave.
*Fletcher, Charles R.	Hotel Lovejoy
Fletcher, W. H.	312 Westlake Ave.
Follansbee, Dr. E. A.	Laughlin Bldg.
*Foshay, Professor J. A.	Chamber of Commerce
French, John B.	Pomona
Gardner, Ellen M.	717 Burlington Ave.
Gardner, Mrs. J. W.	717 Burlington Ave.
Gamber, Dr. B. F.	Johnson Bldg.
Germain, Eugene	953 S. Hope St.
*Goodwin, O. H.	321 W. Ave. 37
Gordon, Dr. F.	Braly Bldg.
Gregory, Professor Lyman	High School
Hahn, Anna	743 S. Hill St.
Hardison, W. L.	Tajo Bldg.
Harriman, George	2144 Flower St.
Hartley, Mary M.	1350 Constance St.
Harrison, Arthur W.	330 W. 30th St.
Hasse, Dr. H. E.	Soldiers' Home
*Haynes, Dr. John R.	945 Figueroa St.
Hecht, Rabbi S., D. D.	817 Beacon St.
Houghton, Dr. Arthur D.	417 W. 29th St.
Howe, F. A.	1513 Millard Ave.
*Hoyt, A. S.	Pasadena

*Hughes, Dr. West	500 W. 23d St.
*Hunt, Dr. J. C.	Grant Bldg.
Hunter, Elmer S.	334 S. Figueroa St.
James, Geo. Wharton	Pasadena
Jevne, H.	849 S. Burlington Ave.
Johnson, A. Campbell	Garvanza
Johnson, Rt. Rev. J. H.	523 S. Olive St.
*Johnson, Dr. J. H.	814 W. 7th St.
Jones, F. D.	226 W. 1st St.
Jones, Mary	Public Library
Jones, W. M.	721 W. 23d St.
Kearney, Dr. Elizabeth F.	2109 Estrella Ave.
Keese, Samuel J.	Trust Bldg.
Kerckhoff, H. H.	638 Maple Ave.
*Kinney, Abbot	Stimson Bldg.
*Knight, Wm. H.	1012 W. 8th St.
Koebig, Dr. A. H.	Stimson Bldg.
*Larkin, Professor E. L.	Mt. Lowe
Laughlin, Homer, Jr.	315 S. Broadway
*Lee, Dr. J. M.	723 Coronado St.
Leslie, Professor Geo. P.	High School
Loeber, Jacob	326 S. Broadway
*Low, A. H.	1417 Hoover St.
Low, T. C.	1417 Hoover St.
Lowe, Professor T. S. C.	Pasadena
Mabury, Wm.	1008 Diamond St.
*Macleish, Dr. A. L.	Bradbury Bldg.
*Macleod, Malcolm	600 S. Alvarado St.
McBride, Dr. J. A.	Pasadena
*McClelland, Professor E. S.	Occidental College
McConville, J. B.	Lankershim Bldg.
*Mattison, Dr. F. C. E.	Pasadena
Maude, F. Homer	1720 Brooklyn Ave.
Miller, Charles M.	512 S. Boyle Ave.
Millspaugh, President J. F.	State Normal School
Mohr, Paul F.	Byrne Bldg.
Moody, Charles Amadon	115 S. Broadway
*Moody, Dr. J. D.	Laughlin Bldg.
*Moody, Mrs. R. O.	San Francisco
Moore, Lester	Tajo Bldg.
*Nevin, Dr. J. C.	1319 Santee St.
Palmer, Professor Elizabeth	High School
Parker, O. K.	Braly Bldg.
Parkhurst, Dr. Burleigh	Douglas Bldg.
*Parsons, Geo. W.	107 S. Broadway
*Patterson, W. C.	Los Angeles National Bank
Payne, Theodore	440 S. Broadway

Perkins, Professor H. B.	Pasadena
Petter, A. J.	226 S. Olive St.
*Phinney, Dr. Carl H.	10th and Flower Sts.
Pierce, E. F.	125 W. Second St.
Preston, M. B.	412 S. Hope St.
Randall, Professor Wm. T.	Ione
*Rendall, Mrs. T. A.	905 S. Alvarado St.
*Rice, Paran F	Stimson Bldg.
Riversoll, Elfigo	525 Laughlin Bldg.
Robinson, R. D.	1103 W. 30th St.
Robinson, Rev. George	523 S. Olive St.
*Rogers, Dr. James R.	Byrne Bldg.
Russell, Colton	3148 Kingsley St.
Schaefle, W. J.	218 W. 6th St.
Seymour, Miss C. M.	746 W. Adams St.
Solano, Alfred	226 S. Spring St.
Spaulding, W. A.	322 Wilcox Bldg.
Stabler, L. J.	1122 W. 30th St.
Stewart, John	1417 E. 21st St.
Sweet, Mrs. S. M.	121½ S. Broadway
*Taber, G. Major	Laughlin Bldg.
*Tasker, Dr. D. L.	Grant Bldg.
Toll, Mrs. Eleanor Joy	1941 S. Union Ave.
Travelyan, G. Hamilton	1435 W. 23d St.
*Ulrey, Professor A. B.	1435 W. 23d St.
Variel, R. H. F.	302 Tajo Bldg.
*Vischer, Dr. L. G.	Laughlin Bldg.
Vosburg, G. N.	1242 Westlake Ave.
Vosburg, John S.	1012 Bonnie Brae St.
*Wade, E. M.	318 E. 1st St.
*Wadsworth, President Guy W.	Occidental College
Wadsworth, T. S.	Douglas Bldg.
Walker, Rev. H. K., D. D.	1718 S. Flower St.
Washburn, W. J.	1st and Broadway
Wheeler, Mrs. S. A. P.	San Gabriel
*Whiting, Dr. C. A.	Pacific College of Osteopathy
Wigmore, Mrs. John	949 W. Adams St.
Wilson, W. H.	410 E. 3d St.
Winter, F. C.	
Wood, R. J. C.	1926 S. Grand Ave.
*Woodbridge, Dr. S. M.	South Pasadena
*Woodbridge, John, D. D.	South Pasadena
Woollacott, H. J.	1006 S. Hope St.
Wright, B. F.	1812 Winfield St.
Yates, Wm.	153 W. 22d St.

BOARD OF DIRECTORS, 1904-1905.

Professor Melville Dozier, President.
John D. Hooker, Vice President.
B. R. Baumgardt, Secretary.
G. Major Taber, Treasurer.
Wm. H. Knight, Chairman Section of Astronomy.
Dr. Anstruther Davidson, Chairman Section of Botany.
Professor A. B. Ulrey, Chairman Section of Biology.
George W. Parsons, Chairman Section of Geology.
Dr. S. M. Woodbridge, Chairman Section of Agricul. Chem.
Dr. Theo. B. Comstock.
Dr. C. A. Whiting.

Standing Committees.

Program—Ex-officio, Dozier, Knight, Davidson, Ulrey, Parsons, Woodbridge, Baumgardt.
Publication—Comstock, Davidson, Knight.
Finance—Parsons, Whiting, Hooker.
Membership—Taber, Woodbridge, Baumgardt.
Affiliation—Knight, Ulrey, Davidson.

Secretaries of Sections.

Astronomy—Professor Melville Dozier.
Botany—Colton Russell.
Biology—Dr. C. A. Whiting.
Geology—G. Major Taber.
Agricultural Chemistry—E. M. Wade.

Meetings, (Every month except July and August.)

Academy, General, First Monday.
Section of Biology, Second Monday.
Section of Astronomy, Third Monday.
Section of Geology, Fourth Monday.
Section of Ag'l. Chem., Section of Botany, } as arranged.*

All regular meetings of Academy and Sections are held at the State Normal School, West Fifth and Grand avenue.

Secretary's Office—116 N. Broadway.

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*At present these two Sections meet at offices of their respective Chairmen. Section of Botany, Third Tuesday Evening, each month.

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VOL. III. NOVEMBER, 1904 NO. 8

BULLETIN
OF THE
Southern California Academy of Sciences

COMMITTEE ON PUBLICATION
THEO. B. COMSTOCK, S. D.; A. DAVIDSON, C. M., M. D.; WM. H. KNIGHT.

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MAILED DECEMBER 7, 1904

This Means You!

Don't put this aside until you have accomplished something in the way of adding to the membership. There is no organization which fills the place of the Southern California Academy of Sciences. It provides a course of forty high class lectures, each year, with ample opportunity of publishing much valuable literature, besides preserving the work of local investigators. It will not keep down and it will continue to prosper in spite of any fate or any degree of meager support. But it deserves well at your hands and your best interest lies in upholding its work. **Act now and do not forget.**

THANKS TO THE EBELL

The joint meeting of the Los Angeles Ebell and the Academy was a great success, owing to the goodness and self-sacrifice of the ladies of the Ebell. Disappointed by the tardy arrival of Sir John Murray's belated train, they were unable to meet the distinguished guest in their own hall, as previously arranged, and they generously united with the Academy, transferring to it a goodly share of the honors, while themselves sharing most heavily in the expense and providing the larger portion of the audience.

TRANSACTIONS FOR OCTOBER, 1904

I. ACADEMY SESSIONS.

1. Regular Monthly Meeting.

The second meeting of the Academy for the fiscal year was held at the State Normal School, Monday evening, October 3, 1904. President Melville Dozier in the chair.

In fitting words of commendation of the Government work towards the preservation of the wild animals now being ruthlessly slaughtered in American forests, and more especially the effective service rendered by the gentleman introduced, President Dozier presented the speaker of the occasion, Mr. Alden Sampson, formerly game preserve expert of the Bureau of Forestry of the United States Department of Agriculture.

Mr. Sampson read a most valuable paper on the "Present and Prospective Game Preserves of the United States, "showing how incidental to other contemplated objects have heretofore been the refuges vouchsafed to the noble game which reckless slaughter has wofully decimated almost to extinction of some species, as the buffalo, grizzly bear, elk, moose, etc." The present anomalous and ineffective policy of the Government, due to the lack of segregation of authority, was briefly stated and a clear notion was given of the work already accomplished, as viewed by the speaker in a journey of 13,000 miles while inspecting the refuges in actual operation.

This paper was highly appreciated by the audience, as was evinced by a warm vote of thanks tendered the speaker at the close. Some discussion was participated in by President Dozier and Messrs. Collins, Stewart, Knight, Taber, Comstock and others.

The secretary pro tem. announced the list of new members elected by the Board, after which the president made announcements regarding meetings of Sections and the Academy in November, making also a strong appeal to the members to aid in extending the influence of the Academy by personal effort.

An invitation from the Ebell Club to members of the Academy to attend the lecture of Sir John Murray, of Challenger fame, to be given Monday evening, October 10, was read by the president and formally accepted.

The Session was then adjourned to meet again Monday evening, November 7. THEO. B. COMSTOCK, Secretary Pro Tem.

2. Extraordinary Meeting.

The regular monthly meeting of the Section of Astronomy gave place October 17 to a gathering of the Academy in association with the Los Angeles Ebell Club. at the Normal School, to listen to a lecture by Sir John Murray, of Edinburgh, upon "Oceanology." An audience of 800 of our leading citizens listened attentively to this able and interesting address. President Dozier, of the Academy, presided. The distinguished lecturer spoke feelingly and in an entertaining manner of the work of the Challenger Expedition of 1872, and of dredging enterprises under the auspices of other governments than his own, particularly of those conducted by Americans, including that now engaged in the South Pacific under our esteemed Alexander Agassiz. The conclusions reached by authorities regarding the topography of the ocean beds and the nature of the deposits accumulating thereon were clearly outlined, with remarks indicating the speaker's deductions from known facts.

The cordial thanks of the Academy are due the many members of the Ebell who were present, and we trust that they may not be averse to meeting often with us in our own sessions.

An outline of Sir John's address is given elsewhere in this issue of the Bulletin. B. R. BAUMGARDT, Secretary.

II. DIRECTORS' MEETING.

The Board met at the State Normal School, Monday, October 3, 1904, at 7:30 p. m. Present: President Dozier, Messrs. Knight, Davidson, Whiting, Woodbridge, Taber, Comstock, the latter acting as secretary in absence of Mr. Baumgardt from the city.

The resignation of Mr. S. G. Bennett, U. S. Geological Survey, now residing in San Francisco. was regretfully accepted at his own request on account of removal.

Bill of Baumgardt Publishing Company for printing, postage on Bulletins, etc., amounting to $3.50, was approved and ordered paid.

Members elected in due form:

President J. F. Millspaugh, Professors Frederick H. Beals, Charles M. Miller and F. A. Hull, of the State Normal School; Mr. Elmer S. Hunter, 334 South Figueroa street, and Mr. W. H. Fletcher, 312 Westlake avenue.

After considerable discussion relatinbg to proposed changes in the Constitution or By-Laws, as regards annual dues and membership fees, the Board, in a vote, expressed its approval of the reduction of annual dues to $2.00 per annum, beginning January 1, 1905, and abolition of membership (initiation) fee. Mr. Comstock was directed to report at next meeting of Board whether this will require an amendment to the Constitution or a change of the By-Laws.

The Publication Committee, by Comstock, chairman, reported that the Constitution and By-Laws, Reports of Officers and other official matter, with list of members, as ordered printed by the Board, will require twenty-four pages for the October issue of the Bulletin, and authority was asked to issue a double number of thirty-two pages in order to include other important matter in hand. This action was unanimously approved and a resolution was passed that 1,000 copies of this issue of the Bulletin be printed for use as a campaign document in securing members.

Much discussion was had regarding the best means of enlarging the usefulness of the Academy and the increase of its membership.

Adjournment followed.

THEO. B. COMSTOCK, Secretary Pro Tem.

III. MEETINGS OF SECTIONS.

1. Section of Biology.

The regular meeting, October 10, was called to order by the chairman, who gave a general outline of the proposed work of the Section for the current year.

Minutes of last meeting read and approved. C. A. Whiting made a brief report on the structure and function of the **cauda equina**. The point which the speaker attempted to make was that the lumbar enlargement of the cord represents about thirteen segments. Considerable discussion followed.

A. B. Ulrey made a most interesting report on some pond organisms which he collected in Westlake Park. He carefully described many of the life processes in these organisms. The whole report was intended as an introduction to somewhat more technical work which is to be presented at the next meeting of the Section, November 14. The paper was discussed at length by several members.

About eighteen members were present.

Mr. Knight, chairman of the Section of Astronomy; Mr. Tabor, secretary of the Section of Geology, and the chairman of this Section, Mr. Ulrey, announced the subjects of lectures for October and the Academy meeting in November.

The meeting then adjourned.

C. A. WHITING, Secretary.

2. Section of Astronomy.

(As previously stated, no meeting of this Section was held in October, owing to the extraordinary meeting of the Ebell and the Academy, which was substituted therefor. Mr. Baumgardt's report of his visit to the International Congress at St. Louis, as a delegate from the Academy, has consequently been postponed to November 21.)

3. Section of Geology.

Regular monthly meeting held at State Normal School, Monday, October 24, 8 p. m. Chairman Parsons being absent, Dr. Theo B. Comstock presided.

A brief paper, entitled "Fossil Peak, Catalina Island," by Blanche Trask, was read by the chairman. Title of paper by Dr. Theo. B. Comstock was announced, "Notes on Structural Materials in Southern California."*

Mr. J. B. Lippincott, Supervising Engineer of the Reclamation Service of the U. S. Geological Survey, for this district, was then introduced and gave a very interesting account of the plans for irrigation of the arid lands in California and Arizona from the waters of the Colorado River, known as the Yuma project. A very lucid explanation followed of the classification adopted in order to properly carry out the work. This being now, in his opinion, somewhat complicated and liable to interference of authority, he recommended a businesslike rearrangement of the general plan of administration. Valuable statistics and some details regarding various projects under way were concisely presented and illustrated by blackboard sketches.

After the address a number of questions put by members were answered satisfactorily.

Professor Dozier, president of the Academy, made a strong plea for greater interest among members, when announcing the subject of the lecture for the next meeting, November 7.

Adjourned to Monday evening, November 28.

4. Section of Botany.

This Section met at 501 Laughlin Building, the chairman in the chair. Dr. A. Davidson read a paper on the "Flora of Clifton, Arizona." A number of specimens of the Malvaceae were shown, one of which was new to the United States.

COLTON RUSSELL. Secretary.

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*This paper is crowded out of the Bulletin this month.

Oceanology*

BY SIR JOHN MURRAY, K. C. B., EDINBURGH, SCOTLAND.

(Abstract of Lecture before the Academy and the Los Angeles Ebell, October 17, 1904.)

The ocean was long regarded as unconquerable by man. The poet, Byron, expressed this sentiment when he wrote:

> "Ten thousand fleets sweep over thee in vain;
> Man marks the earth with ruin—his control stops
> with the shore."

And yet man has not been content to admit his lack of mastery over even this mighty power in nature. So completely has the science of marine engineering overcome the obstacles of the deep that I think we may safely claim that vessels are now afloat capable of resisting the onset of any storm which can occur at sea.

The methods of study are probably familiar to many of you, but some will be interested by a brief description of the work of an expedition and the means adopted to secure accurate evidence for the upbuilding of a science of oceanology. The principal observations include: soundings to determine depth over the ocean bed, from which to construct maps of its topography; the recording of temperatures at varying depths; the collection of samples of mud by dredging over the floor of the ocean, and the gathering of animate forms for purposes of study of the effect of pressure, temperature and other conditions of environment.

For each and all of these, instruments have been constructed which are well adapted to their uses. Soundings are taken with light strong wire or with hempen rope, at the end of which are attached sinkers, sometimes of three or four hundred weight, surrounding a heavy iron tube in which is placed a registering thermometer, and a greased cup for getting mud from the sea bottom. Usually a registering pressure gauge is also provided, and a water bottle designed to collect from the lowest stratum. Bottom dredging is performed in a different manner. The line is played out for several miles from the rapidly moving steamer, so that it does not settle deeply, then it is allowed to drop gradually to the ocean floor and is dragged slowly to scrape up mud and such life as may there exist.

The maximum depth of the ocean, which is really local and near the new possessions of the United States, in the Indian Ocean, is less than six miles. About five miles is the greatest depth over a considerable area, this also in the Indian Ocean and the Pacific south and north of the equator. Excluding cones, buried or but little above the surface of the water, the average depth of the whole ocean bed is but little more than 18,000 feet.

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*The editor of the Bulletin regrets that he has been unable to submit either the proof or the MS. of this abstract to the lecturer. Believing that he has quoted accurately as to principles, nevertheless, this responsibility rests wholly with the editor.

The results of ocean exploration are numerous and interesting, but there is only time now to go briefly over them. If we leave out of account the local effects of inflowing rivers and the changes induced by living agents along the coast and the borders of islands and more or less submerged cones—i. e., excluding the shallow water areas—there is not much divergence in the composition of sea water. And the same holds good with respect to depth as well as latitude and longitude. That is to say, however much the water of the ocean may vary, from point to point, in temperature, pressure or otherwise, it has about the same chemical ingredients, although there may be differences in density.

At the surface of the ocean plant-life is far more abundant than at any point on land. Within 600 feet of the surface, plant life is profuse but not below that depth, which is the limit of light penetration. At deeper levels, down to the maximum depth of the floor, animal life exists, and this is fairly prolific at the very bottom. All the animals there are of the type of mud-grubbers and many of them are provided with organs especially adapted to their environment, very different from those living where light abounds. One form has phosphorescent light at the tips of its tentacles, another has a protruding eye-like organ which glows at the end, furnishing a light which it can direct at will over a wide field. Eyes show a gradual change in various forms at different depths, and they are absent in many deep sea animals.

The light which enables the animals to see at great depths is undoubtedly phosphorescent. This source of illumination is common at the ocean's surface, as you must have observed frequently on your own sea-coast. In mid-ocean the waves in the wake of a moving vessel exhibit it brilliantly at night. We were frequently able to read fine print by its aid alone on the deck of the Challenger, fifteen feet above the water.

My own views, I must admit, have not been fully accepted by all geologists, but I am well convinced that the former general belief that limestones are mainly detrital will not hold for the deposits in mid-ocean. I strongly incline to the opinion that all true limestones not made up of cemented aggregates of shells, have passed through living organisms. In the deep sea, the animals work over the mud, extracting the organic matter and rejecting the limy fragments of shells. Coral building organisms secrete lime-rock within their own tissues.

One point of great importance to geologists is the distribution of deposits of phosphates and glauconite. We do not find any of these now forming, except along the coasts in peculiar situations. They are invariably in localities where cold currents may, at intervals, rush in to warmer zones of the sea, destroying much of its life. Thus, off the coast of Canada and the northeastern portion of the United States, we have the report from the Fish Commissioners that untold millions of fish and other denizens of the ocean were killed in a stormy period. Their remains formed a layer several feet in thickness in parts of the tract. From their decay and by processes well enough understood beds of phosphate are built up, and in connection therewith glauconite is also formed.

Thus is explained the location of such deposits in Florida, at the Cape of Good Hope, in Algiers and elsewhere, always near the coast borders, representing areas of former shallow submergence. Something of the same action is also taking place along the North Pacific coast, in Canada and the United States, and I presume that beds of glauconite and phosphate are there to be found.

The deposition of sand grains is now known to be confined almost wholly to degradation of land surface. There is practically no accumulation of silica in the deep sea, except in regions where melting icebergs drop the material which they have transported from the land. Diatoms and other organisms with siliceous parts thrive in many parts of the ocean, even away from the areas of detrital deposit. The explanation of some of these facts is still obscure.

Contrary to general belief heretofore, there is no evidence of convection currents in the deeper layers of the water. Below 600 feet in depth, both light and heat are independent of atmospheric influences. Not more than one degree of difference in temperature, upon the average, is discernible in very deep water over the whole area of the oceans.

The old idea of geologists that the oscillations of the continental areas have had their counterpart in changes of the great base-level plateau underneath the ocean, do not appear to be warranted by the discoveries of oceanologists. They tend rather to show that the continents have grown independently and that they are now growing by a process of hydration. This means the absorption of water from the ocean, producing earth masses of less specific gravity than the covered portions on the basal plateau. This view explains the known difference of action of the pendulum over the land and in mid-sea, and gives me reason to conclude that the continents are growing at the expense of the sea. It would then appear that the main cause of land movements is pressure from the sea.

The pressure at great depth in the ocean is, of course, very great, amounting to more than 800 pounds per square inch at five miles. But the differences in water at the surface and on the bottom are not as much as might be supposed. This arises from the very great resistance of water to compression. If the action of gravity were to cease, the surface of the ocean would rise only about 200 feet. The great pressure is manifested in all directions, and sometimes thermometer bulbs are smashed to dust where not sufficiently protected in sounding. Adequate provision must be made against this enormous pressure, both to prevent what oceanologists call "implosion," as in the case cited, and explosion by outward bursting of water bottles; for instance, by expansion on reaching the surface, through excessive diminution of pressure.

The water at the bottom of the ocean where it is very deep is extremely cold, even at the troipcs, there being very little difference in temperature at different latitudes. The mud brought up in the dredge is cold enough to be used as ice in cooling bottled beverages.

The ocean floor is covered with a deposit made up of fragments of shells, of vegetable detritus and other fine-grianed material such as may drop from the rich life-zone of the first 600 feet from surface. There are also commonly found minute spherules, of the size of a pin head, say not more than six or eight to a pint of mud, which have centers of dense metallic iron. These are undoubtedly of meteoric origin, apparently contributed from sources outside our own planet. My observations and other records all go to show that there is no such thing as a continuous shower of cosmic dust over the oceans.

The limits of my time and the lack of illustrative material at hand, as well as the audience before me, forbid more than these broad generalizations here. Much as we have learned, there remain many questions to solve of great interest and of far-reaching importance. Some of these must have great influence upon the future development of geographic and geological science. I thank you for your attention and the interest you have shown in this work.

Dr. Herman L. Fairchild, of the Rochester (N. Y.) University, has brought out a new edition of Dana's Manual of Geology, revised in accordance with the new conceptions as put forth by Professor Chamberlin. Those who accept these principles have faith that their influence upon the science of geology will be as far reaching and as stimulative as were the promulgations of Darwin's and Spencer's tenets in the field of Biology.

Work of the United States Reclamation Service in California

BY J. B. LIPPINCOTT, Supervising Engineer.

(Read Before the Section of Geology, Oct. 24, 1904.)

There is anomaly in the classification of the Government work as relates to the administration of certain departments. The resulting complications have caused less practical duplication of work than would have occurred otherwise, because the defects of the system are very well appreciated upon all sides.

The United States Geological Survey has been given charge of that portion of the study and construction which relates to the utilization of the nation's water supply for the benefit of the greatest possible number of inhabitants. Briefly stated, the plan of operations in each irrigation district is as follows:

When the actual owners of the land have accomplished the proper organization of an association for water distribution under conditions now clearly established by law, the Government formally agrees to build and operate suitable headgates without charge for taxes or interest. The original cost must, however, be paid back to the Government by the users, in such annual charges for the water as may be necessary to liquidate the total sum in a long series of years. The national Government contracts directly with the local association, but it is stipulated that from 40 to 160 acres shall be the maximum allowance for each land owner and that shareholders shall be land holders only, at one share per acre.

Under these requirements of law, already a large amount of work has been undertaken. Each district is in general charge of a supervising engineer, with an adequate corps of engineers, assistant engineers and other employes. These gather the necessary information and submit projects which are carefully scrutinzed by a board of six consulting engineers.

The California District extends from Central Oregon to and including the Colorado River. Work is now well advanced in this large area upon four projects of importance, which together are estimated to contain sufficient water, properly conserved, to irrigate considerably more than half a million acres of land accessible therefrom.

Below are given brief outlines of the work thus far undertaken in this California District under my supervision:

Klamath Project.—Klamath River, outlet of Klamath Lake, Oregon, with large swamp areas, feeding by overflow process into Little Klamath Lake (Oregon-California); thence southwestward through Siskiyou, Humboldt and Del Norte counties, California, to the Pacific Ocean. Irrigation is here essential. The lands are flat, the soil fertile, sandy loam, probably capable of economical irrigation. Estimated area to be brought under water, 140,000 acres from Klamath River and 72,000 acres from additional reservoirs, besides about 100,000 acres in Butte Creek Valley irrigable by pumping. About 1,104,000 acres have been segregated for sale, pending examination.

John T. Whistler and H. E. Green, engineers, made preliminary reports upon the Klamath project in 1903, justifying a further investigation this season. T. H. Humphreys, assistant engineer, reporting to the supervising engineer, is now in charge, with headquarters at Klamath Falls, Oregon. Topographic surveys of the Horse Fly and Clear Lake reservoir sites are being made under direction of T. S. Chapman. Estimated area of Clear Lake site, about 20,000 acres.

Near Keno, Oregon, F. K. Lowry is surveying the Klamath River to determine the possibilities of lowering and draining Lower Klamath Lake. Existing canal systems are also under survey with a view to utilization in connection with the general project. Gauging stations are maintained at many points and records of fluctuations, evaporation, etc., are carefully taken. Much other important work is also in hand, some of which will be prosecuted through the winter.

Sacramento Valley Project.—This is the northern portion (4,196 sq. mi.) of the great Central Valley of California, which, with the mountainous portions, has a total area of 26,187 square miles. The water supply is very great. From 1878 to 1885 the mean annual discharge of the Sacramento, at Collinsville was 25,936,000 acre-feet. The valley is very fertile, but the southern portion is subject to extensive overflow (800,000 acres flooded in March, 1904).

Comprehensive work is planned in co-operation with the State of California and in harmony with the work of the Topographical branch of the Survey and the Bureau of Forestry of the Agricultural Department.

The western side of the drainage basin and the northern portion as far as Pit River, inclusive, have been examined and reservoir sites surveyed aggregating in estimated capacity 1,800,000 acre-feet. Eight gauging stations are now maintained under the care of J. S. Evans, hydrographer. Stream measurements have been regularly taken at numerous points on tributaries. Estimates of cost of constructing dams on Putah Creek and at Jelly's Ferry have been prepared by H. E. Green, engineer.

S. G. Bennett, engineer, is in charge of field work, assisted by L. M. Lawson and J. S. Evans, and they have amassed abundance of data relating to this tract. Their contemplated work includes surveys of reservoir sites at Bieber, Canby, Jess Valley, Goose Lake, Adin and West Valley. After completion of the reports, the assistant engineers will be transferred to the Colorado River project.

Yuma Project.—Maps, plans and careful estimates have been prepared, supplemented by detailed observations of river flow, with a view to the proper utilization of the Colorado River for irrigation in California and Arizona. The project includes head works, and main canals upon both sides of the river, with pumping plants for certain portions of the area to be watered.

After very thorough study by our engineers and detailed examinations by Mr. H. A. Storrs, consulting electrical and mechanical engineer, followed by scrutiny of the board of six consulting engineers, there is a final agreement as to the best means to accomplish the ends in view.

The area to be available under the system is about 86,700 acres, out of some 107,000 acres accessible, a portion of which is too low or too high for economical irrigation at present.

The design adopted for the head works is one which has been thoroughly tested on the Nile. It consists of a loose rock structure with a paving of stones, the whole being tied together with three parallel longitundinal walls of steel and concrete between granite abutments. This is further protected by an apron of loose rock. The height of the weir is to be ten feet above low water. The upper core wall of concrete will rest upon a row of sheet piling driven into the bed of the river.

The handling of the silt is a difficult problem. At each end of the weir there will be a sluiceway 200 feet wide, in solid granite, closed by large gates operated by hydraulic machinery. The capacity of each sluiceway being about five times the low water flow of the river, it is believed that the plan will prove effective in use. But these figures do not adequately express the conditions. The bulk of the silt, as observations prove, passes near the bottom of the river. It is, therefore, proposed to place a row of flash-boards along the intake, so as to admit the water by a skimming process. This will permit the furnishing of the entire capacity of the canal by drawing only one foot in depth from the surface of the river. Besides, the first 3,000 feet of canal on each side of the river will be so constructed that the movement of water will be less than one foot per second. These settling basins are planned so as to be readily scoured through gates opening to the river below the weir.

The construction of the whole system will be substantial and costly, but experience has proven this to be most economical in the end. About $1,000,000 will be expended in the head works portion and the canals are designed to limit seepage and other losses as much as possible.

A very troublesome matter will be the crossing of the Gila River. It has been found necessary to provide for a structure of steel and concrete, 3,300 feet in length, to pass several feet below the lowest bed of the river. It will also be necessary to construct levees of considerable extent along the reaches of the Colorado and Gila rivers. Drainage canals are considered essential also, owing to the natural lay of the land.

The cost to land owners benefited by these extensive improvements is estimated at near $35 per acre, to be paid back to the Government in ten equal annual installments. The cost for irrigation will be about $1 per acre per annum.

The sum of $3,000,000 is now set aside by the Secretary of the Interior, upon the recommendation of the Chief Engineer of the Reclamation Service, for the installation of the Yuma project.

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Fossil Peak, Santa Catalina Island.

BY BLANCHE TRASK.

(Read Before the Section of Geology, Oct. 24, 1904.)

The fossil **Pecten estrellanus** Con. was found three years ago on one of our greatest elevations. It appears like a powder along the trail, while below, the eroded cliff-edge is thick-set with the shells from one to six inches in diameter.

Most of them are cracked and packed in the limestone as though by heavy pressure.

An adjacent peak is topped with rolled pebbles, while the great dikes of volcanic rock are visible here and there. In these erosions rainbows seem to be imprisoned, and when the winter rains set the emerald grasses aglow the effect is dazzling.

In the thousands of miles I have tramped here no other trace of fossils has been found. The elevation is about 1,500 feet above the sea.

A Preliminary Synopsis of the Southern California Cyperaceæ.*

BY S. B. PARISH.

5. SCIRPUS, Linn. Sp. Pl. 47—Bulrush.

Annual or perennial herbs with leafy culms, or the leaves reduced to basal sheaths. Spikelets terete, or obscurely flattened, solitary capitate, spikate or umbellate, the florescence subtended by a 1-several leaved involucre, or non-involucrate. Scales spirally imbricated all around, usually all fertile, or 1-3 lower ones empty. Perianth of 1-6 bristles, or in some species none; stamens, 2-3; style 2-3-cleft, not enlarged at the base, wholly deciduous, or the base persistent as a subulate tip to the achene.Achene 3-angled, lenticular, or plano-convex.

A genus of some 200 widely distributed species.

KEY TO THE SPECIES.

Spikelet solitary.
  Involucre wanting.
    Annual; 2-5 cm. tall........................1. **S. nanus**
    Perennial; 10-15 cm. tall...... ....2. **S. pauciflorus**
  Involucral leaf promptly deciduous..........3. **S. cernuus**
Spikelets normally more than one; involucre persistent.
  Culms 3-angled.
  Principal involucral leaf pungent.
      Leaves 2-6, long and narrow.........4. **S. Americanus**
      Leaves 0-2, short and broad..............5. **S. Olneyi**
  Involucral leaves all foliaceous.
Spikelets large, few, in a short-rayed umbel... 6. **S. Pacificus**
Spikelets small, many, in a decompound umbel..........
    ....7. **S. microcarpus**
  Culms, terete, sheathed at base, tall.
    Umbel of a few short rays; bristles barbed.8. **S. lacustris**
    Umbel decompound, long-rayed; bristles plumose....
    ....9. **S. Tatora**

**Spikelet solitary, terminal; stamens 3; style 3-cleft; achenes 3-angled; culms low, tufted.*

1. **Scirpus nanus,** Spreng. Pug. 1:4. Britton, Trans. N. Y. Acad. 11:74. Britt. & Br. Ill. Fl. 1:262. **Eleocharis pygmaea,** Torr. Ann. N. Y. Lyc. 3:315. Watson, Bot, Cal. 2:221.

Annual; culms filiform, flattened, grooved, leafless, erect, 2-5 cm. tall; spikelet ovoid-oblong, subacute, 3-8 flowered, 2-3 mm. long, bractless; scales ovate to lanceolate, 2 mm. long, pale green, the lower obtuse, the upper subacute; bristles mostly 6, retrorsely barbed, larger than the achene, or wanting; achenes obovoid, smooth and shining, 1 mm. long, acute.

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* Continued from P. 86 (this volume) No. 6, June, 1904.

Specimens, said to be "too young for positive determination," collected April 18, 1854, at Cucamonga, by Bigelow, are referred here by Torrey, in Pac. R. Rep. 4:152. The species is not otherwise known from our region, and perhaps does not occur here. It is widespread both in Europe and America, and is usually found about salt marshes.

2. **Scirpus pauciflorus,** Lightf. Fl. Scot. 1078. Britton, Trans. N. Y. Acad. 11:75. Britt. & Br. Ill. Fl. 1:262. **Eleocharis pauciflorus,** Link, Hort. Berol. 1:284. Watson, Bot. Cal. 2:221.

Perennial by slender rootstocks; culms slender, rigid, striate, leafless, 10-15 cm. tall; spikelets oblong, very acute, compressed, 4-8-flowered, bractless, 5 mm. long; scales dark brown, hyaline margined, lanceolate, acuminate, 3 mm. long; bristles 2-6, as long as the achene or longer, or none; achene stramineous, obovoid, pointed, obscurely reticulate, 2 mm. long.

Bear Valley, 6,500 ft. alt. in the San Bernardino Mts., June, 1894, 3265 Parish. In our specimens the bristles are wanting. The species is a northern one, occurring on the Pacific Coast in the Sierra Nevada at considerable altitudes; eastward in the Rocky Mts., Minnesota, Western New York and Canada; also in Northern Europe.

3. **Scirpus cernuus,** Vahl, Enum. 2:285. Britton, Trans. N. Y. Acad. 11:76. **S. riparius,** Spreng. Syst. 1:208. Watson, Bot. Cal. 2:217.

Annual; culms tufted, setaceous or filiform, erect, 3-angled, 5-15 cm. tall, the uppermost sheath usually bearing a short leaf; involucral leaf solitary, erect, setaceous from a broad scarious base, not exceeding the spikelet, very promptly deciduous; spikelet ovoid to oblong, 2-5 mm. high; scales purple with pale midvein, or pale with brown markings, concave, oval, 1 mm. in diameter; bristles none; achenes brown, granulate orbicular, the inner face flatter and broader than the others, 0.75 mm. in width and height, mucronulate.

Common along the margins of wet streams and ponds, in the Cismontane region, below 1,500 ft. alt. Santa Monica; Hasse. Los Angeles; Braunton, Davidson. San Bernardino; Parish. A species of wide distribution in Europe, Australia and South America; but in North America known only from the Pacific Coast.

*****Spikelets several or many, terminal, subtended by one or more involucral leaves; bristles 1-6; anthers tipped with an appendage, which is hispidulous, except in No. 7; styles 2 cleft; achenes plano-convex; perennials with stout, scaly horizontal rootstocks.***

+Culms 3-angled; sheaths nodulose; bristles retrorsely barbed

++Involucral leaf stiff and erect, apparently continuous with the culm; scales obtuse or emarginate, the stout midvein terminating in a short mucro; spikelets in a sessile cluster.

4. **Scirpus Americanus,** Pers. Syn. 1:68. Britton, Trans. N. Y. Acad. 11:78. Britt. & Br. Ill. Fl. 1:265. **S. pungens,** Vahl, Enum. 2:255. Watson, Bot. Cal. 2:218. **C. triangularis,** MacMill. Met. Minn. Vol. 99.

Culms 1-5 dm. tall; leaves 2-6, at length divergent, rigid, channeled, 1-3 dm. long, 1-3 mm. wide; involucral leaf, 2-20 cm. long, channeled; spikelets 1-4, ovoid to ovoid-oblong, acute, 5-10 mm. long; scales dark brown, ovate-oblong, 3-4 mm. long; stamens 3, appendages conical; achenes brown, obovoid, 1 mm. long, mucronate, equaled by the bristles.

Apparently confined in the Cismontane region to the coastal subregion. Los Angeles River; Davidson. San Diego; Chandler. Wet sand banks, San Pasqual; 1565 Parish. Also reported in the Botany of the Death Valley Expedition as abundant in marshes of the deserts of Inyo County. Throughout North America, and in Chile.

5. **Scirpus Olneyi,** Gray, Bost. Jour. Nat. Hist. 5:238.

Culms more or less deeply triquetrous, 3-20 dm. tall, 2-3 cm. wide; 1-2 of the sheaths usually bearing a thin, broad leaf, 2-5 cm. long, or leafless; involucral leaf, 3-angled, 1-2 cm. long; spikelets 2-20, oblong-ovoid acute, about 1 cm. long; scales brown, broadly ovate; stamens 2-3; achenes brown, obovate, mucronate, 2 mm. long, equaled by the bristles.

Very common in marshes of the Cismontane region; occurring also in the Desert region. Los Angeles; Davidson, Nevin. Temecula; Nevin, Parish. San Bernardino; Parish Salt Creek and Palmetto Springs, Colorado Desert; Alderson, North to Oregon; on the Atlantic Coast from Florida to Rhode Island.

ANNOUNCEMENTS FOR NOVEMBER, 1904.

The audience of 700 of our most intelligent citizens, who greeted Dr. Theo. B. Comstock, the lecturer at the November meeting of the Academy, was stimulating and, we trust, an earnest of awakened interest in the objects of our organization. We should like to see the habit formed of regular attendance upon these monthly sessions.

Monday evening, November 14, the Section of Biology met at the State Normal School. There was a most interesting presentation of "Studies of Some Forms of Chlorophyll-Bearing Microscopic Animal Life of Westlake."

1. Relationships of the Micro-Organisms............Prof. A. B. Ulrey
2 Phosphoresence and Cellulose of Animal Life..Dr. Eleanor Seymour
3. Chlorophyll-Bearing Animals...................Dr. C. A. Whiting

This section has in anticipation for its December meeting (Monday, 12th) a valuable paper by Professor Joseph Grinnell on the "Ecology of Mammals."

BOARD OF DIRECTORS,

1904-1905.

Professor Melville Dozier, President.
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Program—Ex-officio, Dozier, Knight, Davidson, Ulrey, Parsons, Woodbridge, Baumgardt.
Publication—Comstock, Davidson, Knight.
Finance—Parsons, Whiting, Hooker.
Membership—Taber, Woodbridge, Baumgardt.
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Astronomy—Professor Melville Dozier.
Botany—Colton Russell.
Biology—Dr. C. A. Whiting.
Geology—G. Major Taber.
Agricultural Chemistry—E. M. Wade.

Meetings (Every Month except July and August).

Academy, General, First Monday.
Section of Biology, Second Monday.
Section of Astronomy, Third Monday.
Section of Geology, Fourth Monday.
Section of Ag'l. Chem., } as arranged.*
Section of Botany, }

All regular meetings of Academy and Sections are held at the State Normal School, West Fifth and Grand avenue.

Secretary's Office—116 North Broadway.

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*At present these two Sections meet at offices of their respective Chairmen. Section of Botany, Third Tuesday Evening, each month.

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BULLETIN
OF THE
Southern California Academy of Sciences

COMMITTEE ON PUBLICATION
THEO. B. COMSTOCK, S. D.; A. DAVIDSON, C. M., M. D.; WM. H. KNIGHT.

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MAILED JANUARY 9, 1905

Did You Forget?

The Editor of this Bulletin has secured enough new members, by personal effort, to entitle him to say to each reader: "**Go thou and do likewise.**" If every member of the Academy will accomplish one-eighth as much, **per capita,** it will very soon be feasible to make the editorials more attractive. It is not a pleasure, but a disagreeable duty, to urge upon you each month to perform what is no more than your due share of the work of upbuilding the Academy of Sciences. **Kindly avoid over-exertion in the cause.**

A Worthy Example

Mr. J. D. Hooker, who has heretofore contributed more than any other person to the funds of the Southern California Academy of Sciences, has generously defrayed the heavy expense of transporting the equipment of the great Observatory which is being constructed on Mt. Wilson under the direction of Professor Hale and others. We need more members of equivalent calibre.

TRANSACTIONS FOR NOVEMBER

I. ACADEMY SESSION, NOVEMBER 7, 1904.

The regular meeting of the Academy for November was held in the Auditorium of the State Normal School, a large and appreciative audience being present. The speaker of the evening was Dr. Theodore B. Comstock, and his subject, "Wild Nature in the Rocky Mountains."

The lecturer was appropriately introduced by the president of the Academy, attention being called to the fact that Dr. Comstock would speak from the results of his personal observation while engaged in exploring the Rocky Mountains in western Wyoming under the auspices of the government. After a brief and eloquent introduction to his lecture proper, the speaker proceeded to conduct his audience in imagination over the route pursued by his party of explorers, illustrating his descriptions of the magnificent scenery by stereopticon views of rare beauty and excellence. Such exhibitions of the beauty, grandeur and extent of our country, indicating the vast undeveloped resources yet to be utilized for the blessing of the human race, cannot fail to intensify the patriotic pride of our citizenship as well as to add to their enlightenment and general culture.

MELVILLE DOZIER, President.

II. DIRECTORS' MEETING.

The Board of Directors met at the Normal School, Monday, November 21, at 7:30 p. m., the President in the chair and G. Major Taber acting as Secretary. Messrs. L. R. Crowell, J. H. Morrow, Geo. H. Kress, M. D., Wm. Bebb and Chas. F. Lummis were duly elected members of the Academy. Application of Mr. J. W. Badger being informal, was approved, subject to formal presentation later.

Voted to reconsider the resolution passed at previous meeting regarding changes in dues and fees. After some discussion the matter was laid upon the table on account of necessity for adjournment to attend the meeting of Section of Astronomy, it being understood that a special meeting will soon be called for careful examination of the whole question.

G. MAJOR TABER, Secretary Pro Tem.

III. MEETINGS OF SECTIONS.

1. Section of Biology.

The regular meeting, at the State Normal School, November 14, 1904, was opened by a very interesting voluntary report by Prof. Ulrey on an Oegonium which he recently found in the Los Angeles River. The report was illustrated by black-board drawings.

C. A. Whiting briefly reviewed a report which appeared in The Journal of Neurology to the effect that the trunk of a paralyzed Seventh Nerve had been grafted on to the proximal end of an Eleventh Nerve and that eventually the Eleventh Nerve assumed the functions of the Seventh. Dr. Leonard briefly discussed the significance of the phenomena.

The minutes of the last meeting were then read and approved.

The subject of the evening was **Some Unicellular Organisms Found in Westlake Park.** Prof. Ulrey opened the subject by a discussion of the relationship of the various forms. The talk was illustrated by some very beautiful pen drawings as well as by black-board sketches.

The next subject discussed was that of Phosphorescence by Dr. Eleanor Seymore. Her paper was extremely interesting and it dealt with Phosphorescence not only among unicellular forms, but also among higher organisms, such as insects and the lower vertebrates. A considerable discussion followed.

C. A. Whiting then spoke on Chlorophyl in Animal Forms. He briefly described the several conditions under which it is found in animals, beginning with the clearly symbyotic forms and ending with those where the Chlorophyll seems to be an integral part of the animal.

Mr. Knight and Dr. Comstock announced the subjects for the November meetings of the Sections of Astronomy and Geology, respectively.

Prof. Grinnell will lecture before the Biological Section at its December meeting (12th) on **Mammalian Ecology.**

About twenty-five members and visitors were present.

On motion the meeting adjourned.

C. A. WHITING, Secretary.

2. Section of Astronomy.

The Section met in regular monthly session at the Normal School on Monday, November 21, 1904. Present a goodly number and Chairman Knight presiding.

Mr. Knight opened the exercises of the evening by reading a number of recent extracts relative to meteoric observations at various points during the August period, the observations having been confined chiefly to August 10th, 11th, and 12th, and to the Persean group. He also gave an interesting account of an observation made by himself and daughter in November, when they were rewarded with a view of about a dozen fine meteors of the Leonid group. Among the facts of astronomical interest mentioned by Mr. Knight were the following:

Harvard is to have a sixty-inch reflecting telescope.

The bright star Aldebaran is to be occulted by the moon on December 20th, at about 5 o'clock p. m. Aldebaran is said to be eight hundred and eighty times the mass of the sun, with a diameter of over 8,000,000 miles; a distance so great that a meteor traveling at the rate of thirty miles per second, would require over three days to cross the disk of the star. Yet, notwithstanding the immense volume, the accultation will occur in a moment, so great is the distance of the star from us, and will continue for about one hour and eight minutes.

Encke's comet completes its successive periods in about two hours less time each. It will appear again on December 1st, near Altair, which is Alpha Aquilae.

The planet Jupiter is now in opposition for the first time since its fifth satellite was discovered by Prof. Barnard, in 1892. Jupiter's period of revolution is twelve years, and the position of opposition brings it 180,000,000 miles nearer the earth than when in conjunction; and is, therefore, the most favorable opportunity for observation.

The satellites of Uranus revolve about their primary in a direction opposite to the motion of the planet. This movement is apparent rather than real, being due to the fact that the inclination of the planet to the plane of its orbit is about ninety degrees.

The chairman introduced Mr. B. R. Baumgardt, the speaker of the evening, who proceeded, in his own clear and concise form, to give a cursory account of his observations at the World's Fair in St. Louis, where he had gone to attend the international astronomical congress. Mr. Baumgardt gave it as his ponion that in its personnel, discussions and results, this was the most remarkable scientific gathering that has ever been held in the history of the human race. This opinion was confirmed by a number of eloquent editorial extracts, read by him, descriptive of the exceeding excellence and world-wide importance of the congress. Special reference was made to the work of the solar research committee, which is composed of men most eminent in present astronomical investigation, and which committee met to determine, among other things, the true length of a wave of light and to build upon this unit a scientific system of measurements. The speaker gave a most interesting account of a great and notable banquet, at which were gathered over seven hundred recognized scientists of various portions of the world, and at which some of the most famous men of the world spoke in response to toasts.

He also made very complimentary reference to Japan's industry and method of developing the animal life of the ocean, and of her remarkable skill and economy in utilizing for valuable purposes the material which Americans throw away as waste.

In Mr. Baumgardt's description of the intensely interesting tests being made of the comparative excellencies and efficiency of turbine and gas engines at the fair, he expressed preference for the former in matters of power, economy of use, and readiness of adaptation.

The meeting of the Section adjourned, conscious of having enjoyed a profitable hour. MELVILLE DOZIER, Secretary.

3. Section of Geology.

Meeting held at the State Normal School Building, November 28, 1904. Chairman Geo. W. Parsons introduced the speaker, Prof. W. L. Watts, who gave a very interesting lecture on the Geology and Physical Geography of Southern Mexico. In speaking of the general topography of that country he stated that there are two ranges of Sierra Madre mountains with a broad plateau between them. The central portion of Southern Mexico consists of a network of mountains. Some of the peaks are 17,500 feet above sea level. The Tropic of Cancer crosses the center of that section, and below this the climate is warm, tropical fruit being raised in abundance. The mountains are only in part of sedimentary formation, the volcanic rocks covering wide areas. In the more southern portion, wild rubber and cotton' trees are abundant. Remains of an old smelter built 100 years ago stand in a locality in Oaxaca where suitable ores for treatment therein are not very evident. Caves occur in northwest Oaxaca, and there are many mines which were formerly worked at a profit. Farther east, near Pueblo, there is a pyramid similar to those in Egypt. Professor Watts visited numerous mines in several states of Mexico. The geology has been but little studied, the field for exploration being most enticing. Some coal and oil are found in Cretaceous rocks, but the coal is of poor quality. The City of Mexico is now well sewered and healthy. Some Aztec relics in the old temples were also described.

Chairman Parsons then gave a brief description of what he observed in his recent trip to the City of Mexico. Dr. Theo. B. Comstock also made a few remarks relating to the great backbone fault system extending from California, through Nevada, Arizona and Mexico, Professor Watts having previously described its occurrence in Southern Durango.

Some discussion followed in which ladies took part.

G. MAJOR TABER, Secretary.

4. Section of Botany.

At the meeting of the Botanical Section, held November 15, 1904, Mr. Theodore Payne and Dr. Davidson presented papers on "The Desert Flora of Thermal and Neighborhood." Specimens of the rarer species were exhibited. COLTON RUSSELL, Secretary.

Catalogue of Indian Relics Found on Santa Catalina Island.*

BY MRS. M. BURTON WILLIAMSON.

13,343-44. Steatite comali, plain.
13,345-47. Steatite comali, perforated.
13,348. Steatite comali, grooved and perforated.
13,349. Steatite comali, boring unfinished.
13,350. Stone comali, perforated.
13,351. Large stone pipe.
13,352. Stone pipe.
13,353. Stone pipe, broken.
12,354-55. Stone pipe, boring unfinished.
13,356. Stone pipe, with rings.
13,357. Stone pipe, steatite.
13,358. Perforated stones—5.
13,359. Perforated stones—3.
13,360. Perforated stone bead.
13,361. Perforated flat stone.
13,362. Perforated stones, polished on one side—2.
13,363-65. Stone pestles.
13,366. Stone pestle, showing how mended.
13,367. Stone pestle, pear-shape.
13,368. Stone pestle, round.
13,369. Small hammer stone.
13,370. Stone implements—3.
13,371. Rude stone implement.
13,372. Stones for grinding paint.
13,373. Steatite, with grooves—2 pieces.
13,374. Stone implement.
13,375. Perforated stone saw.
13.376-78. Stone implements.
13,379. Implement.
13.380. Fragments, stone implements—3.
13,381. Flint dagger, asphalt on base.
13,382. Flint dagger, broken.
13,383. Flint knife.
13,384. Flint knife.
13,385. Obsidian arrowhead.
13,386. Broken arrowhead and chips—3.
13,387. Stone ring, broken.
13.388. Stone for straightening arrows, broken.
13,389. Bone awls, fragments—8.
13.390. Bone implements, fragments.
13,391. Bone, for extracting marrow.

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*Continued from Page 63 (this volume) April, 1904.

13,392. Bone dagger.
13,393. Bone implement, broken.
13,394. Bone—2.
13,395. Shells.
13,396. Shells, ornaments and pieces of fishhooks.
13,397. Perforated shell ornaments.
13,398. Claws of panther.
13,399. Fragment, basket work.
13,400. Charred.
13,401. Paint.
13,402. Seeds.
13,403. Seeds, ground.

POTTS VALLEY, SANTA CATALINA, CALIFORNIA.

13,404. Large stone dish, broken.
13,405. Unfinished pot of steatite.
13,406. Steatite pot, blocked out.
13.407. Small steatite pots, blocked out—3.
13,408. Small steatite pots, broken—6.
13.409. Fragment, steatite pot.
13,410. Pieces of steatite from ledge.
13,411. Rude stone implements—5.
13,412. Rude implements, chalcedony and quartz—6.
13,413. Small steatite pot, broken.
13,414. Small steatite pot, with groove.
13,415. Fragment, lava pot.
13416-17. Steatite comali, perforated.
13418. Steatite comali, plain.
13,419-20. Perforated stone, digging weights.
13,421-25. Perforated stones, various—5.
13,426. Stone digging weights, broken.
13,427. Pipe stone.
13,428. Arrow straightener.
13,429. Grooved hammer stone.
13,430. Round hammer stone.
13,431. Grooved stone ax.
13,432-36. Stone pestles—15; one broken.
13,437. Small rubbing stone.
13,438. Stone ornament, grooved.
13,439. Stone ornaments, rattlesnake rattle.
13,440. Perforated stone ornament (bifurcated).
13,441. Shell.
13,442. Shell full of seed.
13,443. Bone mouthpiece to pipe.
13,444. Ditto, charred.
13,445. Stone knife.

13,446. Obsidian knife.
13,447. Charred.
13,448-9. Human skulls and bones—2.
13,450. Bones of child found with 13,177, Graves at Isthmus, Santa Catalina.
13,451. Charred ?, found with 13,177. Graves at Isthmus, Santa Catalina.

CATALINA ISLAND, CALIFORNIA.

14,757. Concha zagua.
14,758. Yerba de la bibora.
14,759. Seed used in making "Pinole."
14,760. Cacometas.
14,761. Cobenas.
14,762. Also called Cacometas.
14,763. Cibollas (wild onions).
14,764. Indian tobacco, dwarfed.
14,765-70. Pots, form blocked out—**Quarry, Catalina Island.**
14,771-73. Steatite pots, unfinished.
14,774-75. Steatite pots, broken.
14,776-80. Steatite pots, unfinished, broken—**Ancient Quarry, Catalina Island.**
14,781. Steatite dish, boat shaped.
14,782. Fragments, steatite pot.
14,783-84. Unfinished steatite, comali.
14,785. Chisels, slate—6.
14,786. Rude scraper, quartz.
14,787. Rude scraper, stone.
14,788. Rude scraper, petrified bone (?).

WHITNEY'S PLACE, CATALINA ISLAND.

14,789-93. Skull and bones.
14,794. Stone mortar.
14,795-97. Small dishes, steatite.
14,798-800. Large weights for digging sticks.
14,801-05. Weights for digging stick; 14,802. Polished one side; 14,803. With 7 grooves.
14,806-08. Comali, steatite, perforated.
14,809-11. Comali, steatite, toy.
14,812. Comali, steatite, fragments.
14,813-16. Sharpening stones, variously marked.
14,817. Rubbing stone—6.
14,181. Implements of steatite—2.
14,819. Steatite comali, 2 perforations.
14,820-21. Pipe stones—2.
14,822. Sharpening stone, steatite.

14,823. Stone knife.
14,824. Stone dagger, broken.
14,825. Stone arrowheads—2.
14,826. Stone drills.
14,827. Arrowhead, Obsidian.
14,828-29. Pestles.
14,830. Bone whistle.
14,831. Bone dagger.
14,832. Bone awls.
14,833. Bone implements, bird bone.
14.834. Teeth of Cetaceans.
14,835. Small shell beads.
14,836-37. Shell beads.
14,838. Small glass beads.
14,839. Glass beads.
14,840. Stone bead.
14,841-44. Shell ornaments, many.
14,845. Fragments of shell ornaments.
14,846. Shell fish-hooks.
14,847-48. Circular shell ornaments.
14,849. Small shell dish.
14,850. Ornament of (?).
14,851. Fish spine used as paint pot.
14,852. Vertebra of fish, as paint pot.
14,853. Red paint.
14,854. Fragment of basket work, charred.
14,855. Seed, unknown.
14,856. Shark's tooth, perforated.
14,857. Glass and brass beads on string.
14,858-59. Painted stones, red and white circles.

N. B.—Timm's Place, Catalina Island, is the site of the present town of Avalon. (Locality of No. 14,859.)

NOTE.—William Henry Holmes, head curator, Department of Anthropology, of the Smithsonian Institution, in "Anthropological Studies in California," records a number of curios found by him in an ancient grave at the Isthmus:

"There were also parts of three or four steatite vessels, one small pot, a round shallow dish, two oblong dishes, and a flattish oblong plate with squared end, probably a baking plate. Other articles were evidently mere burial offerings made for the purpose and doubtless symbolic. They include a steatite hook of a form common in the region, a miniature pest of steatite, a peculiar object, apparently a much conventionalized fish or finback whale, three ladles of steatite utensils, apparently dipper handles, an obsidian arrow point, and some decayed shell ornaments."

In deposits of kitchen-middens, Mr. Holmes found "many abalone shells and some rude stone utensils, the latter including a flattish spatulate stone, one end of which was covered with asphaltum."

(Concluded.)

Pre-Historic California*

BY DR. LORENZO G. YATES.

Aboriginal Shell Money and Ornaments.

One of the peculiar characteristics which distinguish mankind is universally developed acquisitiveness, a trait seldom observed among other animals. Ancient history and the oldest remains of man demonstrate this characteristic to have been one of the heritages common to all peoples, under all circumstances.

The skeletons of prehistoric man when unearthed by his successors, are accompanied by the rude and simple personal effects which were buried with the original owners; the weapons and ornaments acquired during life were placed in the grave by surviving friends or family, in order that they might be of service after death, or to relieve the survivors from the unpleasant reminders of departed friends by the sight of their former belongings. Later, as man advanced in civilization and acquired more wealth, his belongings increased in bulk and numbers until it became impossible to bury them all. Then selections were made, and perhaps a favorite weapon, horse, wife or slave was allowed to accompany the dead on his journey to the unknown world. Where cremation was practiced, the property was placed in the fire with the deceased.

Originally exchanges were made between individuals by bartering one thing for another, and one who owned or possessed more of an article of utility or ornament than he required, and being desirous of obtaining some other article which he did not possess, exchanged a portion of his surplus with some other individual who had it to spare. In time this troublesome method was improved upon by the utilization of some peculiar or rare form of a particular material, which could be carried about the person or transported from place to place, and which came to have a recognized or intrinsic market or purchasing value, for the acquirement of the necessaries and luxuries of life.

The first authentic history we have of the Ancient Romans using metal for this purpose was about B. C. 400. At that time the ox was the standard of value. Originally the animals were transferred from one owner to another, but this method of trade being inconvenient, irregular masses of bronze representing the value of an ox were used. These were succeeded by bronze imitations of various animals, representing their value.

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*Continued from Page 10 (this volume) No. 1, January, 1904.

About two thousand years ago the Romans commenced using circular coins of bronze. A coin of this character made about 2100 years ago (Fig. 1. Pl. 1.) is in the writer's collection. It was found in the ruins of Herculaneum.

Among the simplest objects suitable for moneys and adopted as such, were handsome natural crystals, or other forms of mineral substances, and the beautiful shells of the sea shore. These objects, in our age of universal travel and interchange of commodities between nations and peoples throughout the world, are easily obtained; but in the earlier history of our race they were rarely carried far from their original habitat. Those peoples or tribes who had the good fortune to occupy the regions near a sea shore had a great advantage over their neighbors of the interior, in the comparative ease with which they could obtain a supply of the shells which, by general consent and usage, came to represent a bartering or purchasing power. At some time during the history of many tribes sea shells were recognized as universal media of exchange, and to this day the natives of Africa, the Islands of the Pacific, and some other countries use the Cowrie as money. This custom was so general that when, after long ages of advancement, arts and sciences were evolved, and man studied and classified the other representatives of the animal kingdom, the marine shell referred to was named, and is still known as **Cypraea moneta,** or "The Money Cowrie;" (See Fig. 2, Pl. 1). In countries where the cowrie is not found, or was not attainable, other shells of different genera and species were used as representing purchasing power.

In this manner, also, the natural acquisitiveness of the race manifested itself. Man did not stop acquiring when he had sufficient food, weapons and utensils for his immediate use, but these shells were carried on the person, for the purpose of purchasing such objects as their possessor might take a fancy to acquire or store away, to be brought out and displayed upon great occasions, as material evidence of the wealth or importance of the owner. A similar natural pride is shown by more civilized peoples in the wearing of fine clothes, jewelry, diamonds and other precious stones, the display of fine horses and carriages, expensive and elaborately ornamented dwellings, expensive furniture and bric-a-brac.

The Indian tribes of North America have for many ages used portions of marine shells as money, and for more than two centuries these shell beads formed the principal medium of traffic between the Indians and the white man under the name of wampum, or "wampum peage"; and so wide spread and common was its use that the whites gave it a legal status by fixing its value and making it a legal tender for any sum under twelve pence, at the rate of six beads for a penny. In those days (1637) money had a much greater purchasing capacity than it has at present.

In New York, for nearly half a century, wampum was almost the only currency in use, and was employed in the Indian trade down to nearly the middle of the nineteenth century.* Connecticut at one time made it a legal tender for any amount and receivable for taxes at four beads for a penny. This "wampum" of the Atlantic Coast was the exact counterpart of some of the "shell money" of the Pacific Coast, although made from different species of shells.

While cowries and other shells which were used entire, were rated by their beauty and their convenient form and size, the value of the individual piece of shell forming the beads of which the string of wampum was composed rested on the amount of labor it represented. The cowrie was the lazy man's coin, for when found on the sea shore it was ready coined by nature; but. in other cases, the shell was first broken into pieces of suitable size, then rubbed on a stone to give the proper shape, then pierced with a drill point of stone, when it was ready to string, after which the final finish was given by rubbing between flat stones. The fragments were sometimes used without being strung, when they were called "sewan."

Strings of white shell beads were most commonly used, and they were valued according to the number of beads or the length of the string. It was not to its purchasing power alone that wampum owed its valuation. The social system of the aborigines required that on all state occasions, great public acts should be accompanied by a display of wampum. A string of wampum was the emblem of the authority by which a messenger summoned the members of the tribe to council; a string of wampum was laid down at the end of each clause of a treaty between ambassadors of different powers; treaties were ratified by exchange of wampum; war was declared by the formal delivery to the offending party of a belt of black wampum. A string of black wampum borne by a messenger announced the death of a chief, and at his burial large quantities of it were placed in the grave with the body, or burned with it if the body were cremated; the object in either case being to supply the deceased with funds for his journey.

Major Rodgers, in writing of North America, in 1765, says of the wampum used by the Indians of that time:

> "They have the art of stringing, twisting and interweaving them into belts, collars, blankets, moccasins, etc., in ten thousand different

sizes, forms and figures, so as to be ornaments for every part of dress, and expressive to them of all their important transactions."*

"According to the Indian conception, these belts could tell, by means of an interpreter, the exact rule, provision, or transaction talked into them at the time, and of which they were the exclusive record."**

They mix and dispose the wampum of different colors and shades, so as to be significant among themselves of almost anything they please, and by these their words are kept and their thoughts communicated to one another, as ours are by writing.

As there were no restrictions on the production of wampum by the white people, the Dutch burghers of New Amsterdam embarked in its manufacture. But, although they had the advantage of machinery and better tools, they did not make a success of the business; for we learn that the counterfeit was so poorly made that Massachusetts and Connecticut were obliged to legislate upon the subject of "bad, false, and unfinished peage" (wampum peage, or shell money).

Shell Money of California.

Although we know comparatively little of the former history or the details of the life and customs of the aborigines of our coast previous to its settlement by the whites, it is certain that they used shells for money and ornaments. Exploration of the ancient graves has shown that the custom of burying money with the dead was practiced long before their contact with the white people. The Indians of the northwest used the Dentalium, or tusk-shell, as money (See Fig. 3, Pl. 1) and with them its use was almost as common as was that of wampum on the Atlantic Coast. Among the Indians of Northern California this tusk-shell money was called alli-co-cheek, meaning Indian Money.

These shells are collected by the Indians in the following manner:

> "An Indian when shell-fishing arms himself with a long spear, the haft of which is of light deal; to the end of it is fastened a strip of wood placed transversely, but driven full of teeth made of bone. The whole affair resembles a long comb affixed to the end of a stick with the teeth very wide apart. A squaw sits in the stern of the canoe, and paddles it slowly along, whilst the man with the spear stands in the bow. He stabs this comb-like affair into the sand at the bottom of the water, and after giving two or three prods, draws it up to look at it. If he has been successful perhaps four or five money shells have been impaled on the teeth of the spear."***

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*See Horatio Hale, on "The Origin of Primitive Money," in Popular Science Monthly, January, 1886.

**Ethno-Conchology, by R. E. C. Stearns, in Report of U. S. National Museum, 1886-87, p. 313, Washington, 1889.

***Report of U. S. National Museum for 1886-87, p. 315.

The unit of value of this currency differed somewhat among the different tribes; with some it was a string of the length of a man's arm, consisting of a certain number of long shells from the end of the fingers to the elbow, and shorter ones above. Such a string was formerly valued at from forty to fifty Dollars in gold. With others, the standard of measurement was a string of five shells, valued according to the length of the shells. These were worth from ten to twenty-five dollars in gold; or, from two dollars a shell for those of ordinary length, to five dollars a shell for the longest. A wife could be bought for from three to ten strings of alli-co-cheek.

This dentalium money was also highly prized by the Indians of the interior, and, as late as 1866, ten of these shells would buy a superior buffalo robe. Among the Indians of Southern California the Dentalium was used in a subordinate way, also; but the use of the "tusk-shells" (Dentaliums) as money or ornaments was much less common than in the extreme northern portion of the state. The shell-money made from the columellas of some of the larger univelve shells had a Dentalium imbedded in asphaltum at the lower, or larger end, thus reducing the size of the opening to make it correspond with the upper end or point of the shell bead, to hold it in the proper position when strung with other money.

The Dentalium was, moreover, a very ancient inhabitant of California; for, in some rock recently brought from an altitude of over 6,000 feet on the San Rafael Mountains, several specimens of shells of this genus may be seen. They are also found in other localities imbedded in rocks of cretaceous age.

In Central California the shell money was largely manufactured from the shells of Saxidomus and Olivella. In Southern California, in addition to those named, quite a number of other genera were used, principally the Tivela (Pachydesma) crassatelloides, the "Big Clam" (See Fig. 4, Pl. 1). The Tivela is a bivalve shell of large size, close texture, fine grain, and ivory white color. It is found much larger than here figured, and from one-fourth to nearly one inch in thickness.

Amiantis (Callista) callosa, a somewhat similar shell, which was used for the same purpose, is of finer grain and whiter color. Beads or ornaments made from either of the two above named species of shells can scarcely be distinguished from bone or ivory, for which they are often mistaken.

These represented the bullion from which the money was manufactured, the shell being first cut or worked into suitable size and form, then rounded and drilled (Figs. 5 to 14, Pl. 2). How the aborigines managed to drill holes of the size and length commonly found is a question which has not been satisfactorily answered. It will be seen, by reference to Fig. 11, that the hole, which is of uniform size (one millimeter) throughout, is considerably curved. A line drawn between the two extremities of the hole, on the concave side, would be about one-quarter of an inch from the middle of the curve; yet this hole is no larger than an ordinary knitting needle, is curved to correspond with the outer line of the bead. No drills have been discovered in the graves which would do the work referred to. Figs. 12 and 13, Pl. 2, represent beads drilled with stone tools, but the tapering form of the drill made the holes too large at the ends, and glass beads were used to reduce them to the size required. This style of work, however, was done after the advent of the white people, when glass beads were used instead of the dentalium shells formerly used for the same purpose.*

(To be continued.)

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*See also Figs. 18 and 19, Pl. 3: (to follow)

There is much discussion now concerning the theories which have become traditional among geologists. In different directions and upon new grounds the nebular hypothesis is being attacked as untenable and inadequate to explain phenomena heretofore even used as arguments in its favor. Disclaiming here any intention of assuming to speak for astronomers, there is a growing belief among geologists that a complete revision of the sub-stratum of geologic theory is becoming necessary. That the failure of certain theories, which attempt to explain natural phenomena, to give explanation of the phenomena themselves, has involved geologists in illogical conclusions while employing logical methods of reasoning, is the contention of a writer in the American Geologist.* The discussion of the paper will be taken up in a later issue.

Professor T. C. Chamberlin, Head Professor of Geology in the University of Chicago, has long since taken ground against some preconceived notions in geology, as to the formation of the earth and its general life-history. His views also antagonize the nebular hypothesis and they are closely in accord with some of the opinions expressed by Sir John Murray in his recent lecture on ''Oceanology,'' published in this issue of the Bulletin. Professor Chamberlin adopts what is known as the planetesimal theory of the earth's origin, and he believes that the compression due to cooling is, as it were, squeezing out gaseous ingredients, and that this process, in varying quality, has been going on for ages. In a way this has bearing on the nature of radio-active substances, which are now attracting the attention of investigators everywhere.

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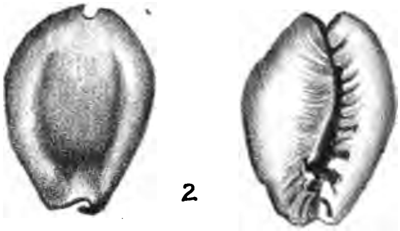
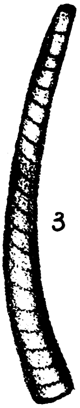
*The Untenableness of the Nebular Theory. By N. Mistockles. Part I., American Geologist, Vol. XXXIV., No. 4, Oct., 1904, p. 226; Part II., No. 5. Nov., 1904. p. 310; Part III., No. 6, Dec., 1904. p. 361.

PLATE I.



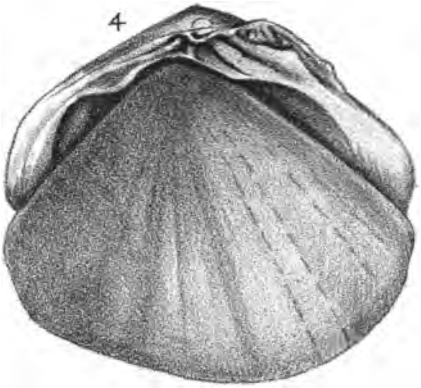
2

THE MONEY COWRIE



3

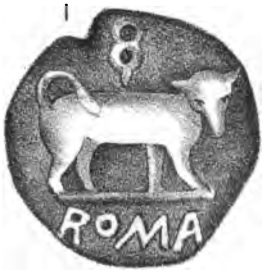
DENTALIUM



4

½ NAT. SIZE.

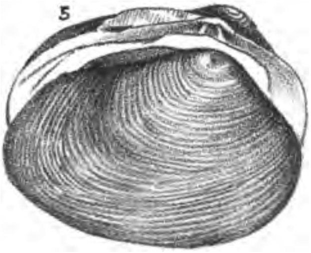
PACHYDESMA (TIVELA) CRASSATELLOIDES



1

½ NAT. SIZE

ANCIENT ROMAN BRONZE COIN
ABOUT 200 B.C.



5

½ NAT. SIZE

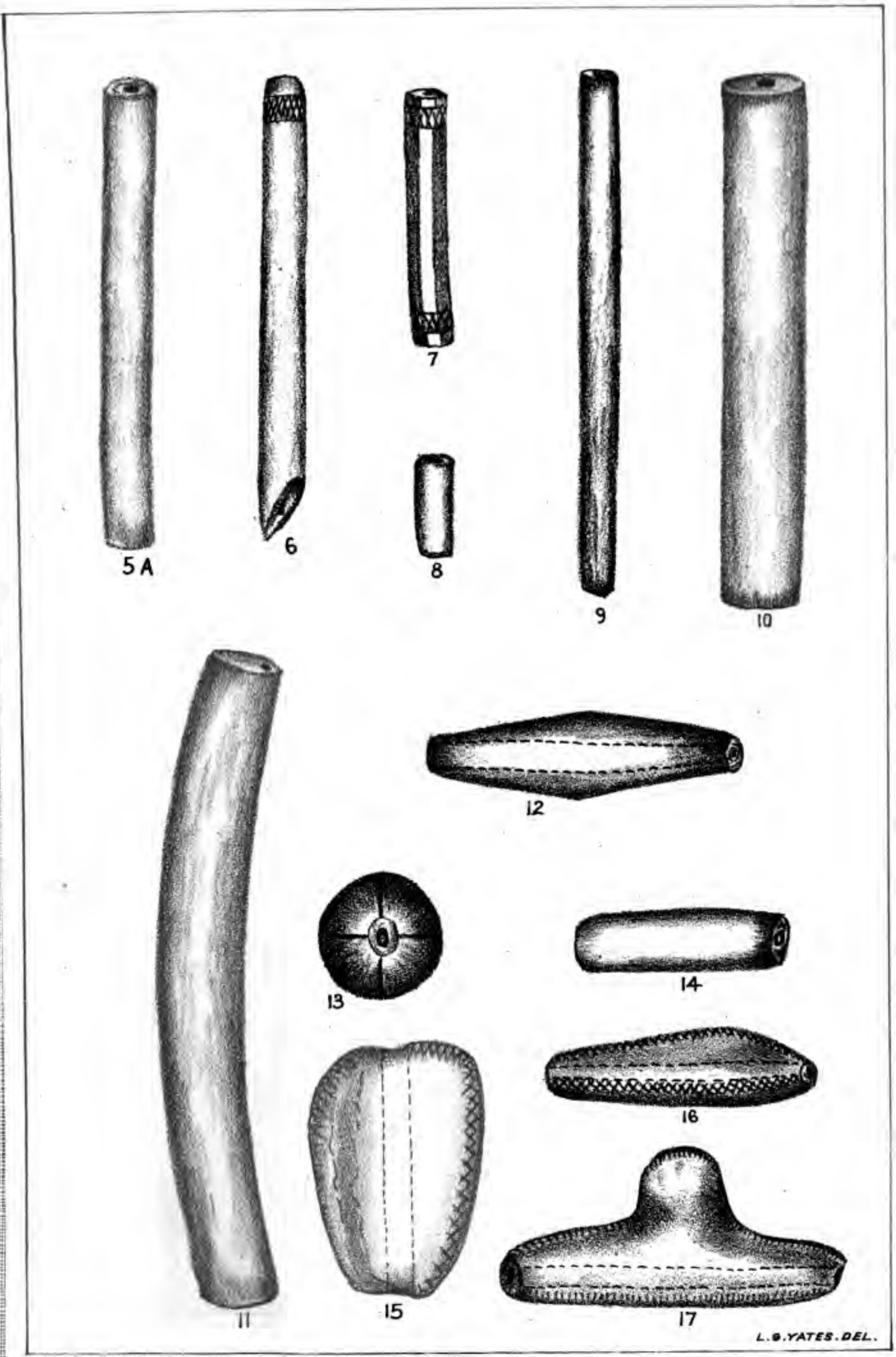
SAXIDOMUS ARATUS

L.G. YATES. DEL.

LITH. BRITTON & REY S.F.

ABORIGINAL SHELL MONEY OF CALIFORNIA.

PLATE 2.



LITH. BRITTON & REY S. F.

ABORIGINAL SHELL MONEY OF CALIFORNIA

The Bees of Southern California. VI.*

BY T. D. A. COCKERELL.

TRACHUSA, *Jurine.*

Trachusa perdita, n. sp.

Male; length about 12 mm.; black; head and thorax rugose, the punctures excessively close, the dorsum of the thorax entirely dull, its pubescence and that of occiput light greyish with a faint yellowish tint; that of face, cheeks, pleura and sides of meta-thorax white; clypeus and lateral face-marks cream-color; the lateral marks triangular, filling the interval between the clypeus and the eyes, and ending a little above the level of the upper margin of the clypeus, the angle formed by the upper margin of the lateral face-marks and the eye a right angle; clypeus shining, the punctures strong, but well separated, a strong median longitudinal ridge; middle anterior margin of clypeus with six little brown nodules; mandibles black; facial quadrangle much longer than broad; antennae entirely black, third joint longer than fourth; thorax black without markings; tegulae very dark brown, strongly punctured; wings stained with reddish brown, especially in the marginal cell; second recurrent nervure passing beyond tip of second submarginal cell; basal nervure meeting transverso-medial; legs entirely black, except that the tibial spurs are reddish-orange, and the claws are ferruginous at base; pulvilli large; abdomen black without light markings, the hind margins of the segments with thin bands of white hair; punctures stronger and closer on the second and fifth segments than on the third and fourth; sixth segment with a subapical nodulose transverse keel from which proceeds a little keel in the middle line to the hind margin, which is ferruginous and curved outwards; seventh segment black, broadly and deeply emarginate; genitalia dark ferruginous.

Tehachapi, California; one collected by Dr. Davidson. The genus **Trachusa** has hitherto been known from Europe, and its discovery in America is of great interest. The present species departs from typical **Trachusa,** and leans towards **Dianthidium,** in the venation; evidently the two genera are closely allied. In general, it is remarkable how greatly our insect resembles **T. serratulae,** which I have from Innsbruck (Fiese).

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*Continued from p. 90 (this volume) No. 6, June, 1904.

Erratum. In part V, p. 88, the characters given under 4 in the table refer to **A. cardui,** ckll. A couple of lines were omitted in printing.

BOMBOMELECTA, Patton.

Bombomelecta edwardsii (Cresson).

Los Angeles, one male (Davidson). Previously known from Ocean View. When sunlight is allowed to fall on the abdomen from in front, the surface presents a strong purple lustre.

CENTRIS, Fabricius.

Centris hoffmanseggiae, subsp. nov. davidsoni.

Male; length about 15 mm.; black; face very narrow, the eyes large and prominent, pale ochreous when dry; ocelli large, distance between the lateral ocelli and the eyes less than the diameter of an ocellus; clypeus, a narrow supraclypeal stripe, and labrum cream-color; clypeus shining and sparsely punctured; mandibles with a cream-colored stripe on the upper margin; pubescence of occiput, mesothorax and scutellum pale ochreous; of cheeks, pleura and metathorax white and strongly plumose; scutellum prominent, shining, with strong punctures well separated; tegulae testaceous; wings rather milky, nervures brown; legs black, the spurs and small joints of tarsi ferruginous; hair of legs white, slightly orchraceous on tibiae in front, very dark brown on inner side of basal joint of hind tarsi; abdomen rather densely covered with erect greyish-white hair; apex produced and rounded; ventral segments with the hind margins whitish. Mandibles tridentate. The type of **hoffmanseggiae,** when the abdomen is viewed laterally, shows short dark fuscous hair on the fourth and fifth segments; **davidsoni** shows larger and entirely light hair on these segments, and is a larger insect.

Banning, Cal., one (Dr. Davidson).

Dr. Davidson's collections are bringing out the fact that in the bees, as in several other groups, species are represented in many instances by an inland form, of the arid parts of Nevada, Arizona, New Mexico, etc., and a closely allied but distinct California form. In the absence of collections from many intermediate localities, it is impossible to say in each case whether these really intergrade; but when they are very closely allied, I treat them as geographical races of a single species for the present. Such a course, while subject to revision, at all events serves to indicate the obvious relationships.

Centris cockerelli, Fox.

I give a new description, as the existing one is rather too short.

Female; length about 12 mm.; black, shining; clypeus (except lateral and superior margins) and labrum reddish in the California specimens, but evidently changed from orange by cyanide; eyes, when dry, gray; vertex about ocelli very shiny, hardly punctured, a tuft of fulvous hair just behind ocelli; hair of occiput whitish, of cheeks white; antennae black; facial quadrangle longer than broad; hair of thorax very dense, tinged with ochreous, and even with fulvous above; tegulae pale testaceous; wings slightly dusky; legs black, with mainly black pubescence, but that on anterior femora behind yellowish-white; the abundant and coarse scopa of hind tibiae and tarsi wholly black; abdomen black, practically nude, only the first segment with pale pruinose pubescence. The pectoral hair of thorax is variably sooty in this species, so **C. foxi,** Friese, must be separated on the characters of the clypeus and labrum, not those of the pubescence.

Palm Spring, Cal., two collected by Dr. Davidson. Previously known from New Mexico.

EMPHOROPSIS, *Ashmead.*

Emphoropsis infernalis, (Dalla Torre) subsp. nov. **tristissima.**

Female; length about 14 mm.; black, robust, with the pubescence entirely black, except a little reddish on hind part of mesothorax, and dark reddish on inner side of basal joints of tarsi; facial quadrangle broader than long; inner orbital margins straight; clypeus coarsely rugoso-punctate; labrum covered with black hair; pubescence of thorax and first segment of abdomen dense, rest of abdomen rather shining and not conspicuously pubescent; tegulae very dark brown; wings only a little dusky; knee-plates of hind tibiae whitish with a large reddish patch, very conspicuous; legs normal, hind tibiae and tarsi more or less ferruginous. Lacks the light pubescence seen in typical **infernalis,** which is from Nevada.

Los Angeles, one, and Lancaster, Mohave Desert, one, both collected by Dr. Davidson.

E. infernalis was described as an **Anthophora,** but Dr. Ashmead wrote me, some years ago, that it was an **Emphoropsis.**

ANTHOPHORA, *Latreille.*

Anthophora crotchii, Cresson.

Dr. Davidson obtained one at Banning; I give a new description, that of Cresson being rather short.

Male; length about 16 mm.; black; head and thorax with abundant yellowish pubescence; that of abdomen more scanty, whitish basally, but erect and black on the third to sixth segments, the sixth fringed with whitish, and a light tuft on each side of the apex; eyes large, reddish when dry; facial quadrangle considerably longer than broad, narrowest in the middle; ocelli large, a prominent tuft of long ochreous hair just behind the anterior ocellus; scape flattened, shining and entirely orange in front, black behind; rest of antenna black; clypeus very prominent and convex, it, the labrum, the lateral face-marks, a supraclypeal band, and the greater part of the mandibles, orange; a tuft of hair on the lower corner of clypeus on each side of labrum; lateral face-marks occupying the space between the clypeus and the eye, and sending a narrow stripe along the inner orbits to a little beyond the level of the antennae; tegulae piceous; wings nearly clear, marginal cell appendiculate; legs black, the tarsi becoming ferruginous; middle femora conspicuously fringed with ochreous hair behind; middle tarsi with long white hairs, the basal joint with short orange hairs within, the last joint with a broad black fan of hairs like a peacock's feather; hind trochanters with a low conical tubercle; spurs of hind tibiae far apart at base; hind tarsi normal except that the basal joint is broadened and flattened; hind margins of the abdominal segments narrowly pallid.

PUBLICATIONS RECEIVED.

Mining Magazine. Vol. 5, No. 4. Dec., 1904.

The Hop Aphis. By Warren T. Clarke. Bull. No. 160.

Tuberculosis in Fowls. By Arch. R. Ward. Bull. No. 161.

Sulphurous Acid and Sulphites as Food Preservatives. By C. E. Calm, Ph. D., Chicago.

Contribution to the Study of Fermentation. Part I. By E. H. Twight and Charles S. Ash. Bull. No. 159.

Univ. of California, Ag'l Exper. Station. California Olive Oil; Its Manufacture. By G. W. Shaw. Bull. No. 158.

Univ. of Arizona, Ag'l Exper. Station. Cost of Pumping for Irrigation. By Sherman M. Woodward. Bull. No. 49.

U. S. Dept. of Agric., Bureau of Soils. Investigations in Soil Fertility. By Milton Whitney and F. K. Cameron. Bull. No. 23.

Univ. of Cal., Dept. of Geology. A New Marine Reptile from the Triassic of California. By John C. Merriam. Bull. Dept. Geol., Vol. 3, No. 21, pp. 419-421.

Maine Agric. Exper. Station. Soy Beans. By Chas. D. Woods and J. M. Bartlett. Feeding Experiments. By Chas. D. Woods. Alfalfa. By Chas. D. Woods. Bull. No. 106, Sept., 1904. Home Mixed Fertilizers. By Chas. D. Woods. Bull. No. 107, Oct., 1904.

Tomo I, No. 5.—Informe Sobre El Temblor del 16 de Enero de 1902 en el Estado de Guerrero. Por los Dres. E. Böse y E. Angermann.—Estudio de una Muestra de Mineral Asbestiforme, procedente del Rancho del Ahuacatillo, Distrito de Zinapecunaro, Estado de Michoacan, Por. el Ing. Juan D. Villarello.

"Parergones del Instituto Geologico de Mexico." Tomo I, No. 4. Estudio de la Teoria Quimica propuesta por El Sr. D. Andres Almaraz para explicar la Formaciön del petroleo de Aragon, Mexico, D. F. Por El Ing. Juan D. Villarello.—El Fierro Meteorico de Bacubirito, Sinaloa. Por El Dr. E. Angermann (Lamina X).—Los Agvas Subterraneos de Amozoc, Puebla. Por El Ingeniero E. Ordonez.

Notes on Structural Materials in Southern California.*

BY THEO. B. COMSTOCK, S. D.

(Read by Title, Section of Geology, Oct. 24, 1904.)

The use of natural products in buildings, foundations and other structures of higher class is annually increasing in Los Angeles and the surrounding country, notwithstanding that concrete has also assumed importance from the boldness with which some engineers and architects have recently brought it into service. But concrete itself is only artificial in a secondary sense. The ultimate constituents are natural mineral products, and one who discusses the subject exhaustively must necessarily take into account the deposits of rock from which the components of cements, mortars and their various combinations are derived.

In this brief paper it is my purpose to confine attention mainly to some particular features of the local natural supply of ready-made building materials, such as granite, marble and the more commonly used building stones. The elements of color, texture, fracture, mineral composition, and even accessibility to market, not to mention just now the durability and suitability in other ways for structural use—all these features have been dependent upon geologic history. That is to say, the geographic distribution, topographic outlines, exposure for working, form of blocks in a given quarry, and the appearance and wearing quality of the rock, as well as the response to tooling and polishing, are not mere chance results. These vary exactly in accordance with conditions antecedent, which can readily be determined and quantitatively estimated by the practical geologist from observations in the field.

A prominent firm who supplied rock upon a contract in Los Angeles started upon the delivery without knowing that their quarry would furnish the needed stint. This risk of loss by failure to comply with their agreement was wholly unnecessary, because a competent geologist could have settled the matter beforehand with moderate study of the ground. There are also certain well-established facts which enable one familiar with the details to determine readily whether any given supply of rock will become useful in the arts. For instance, a grade of marble which is somewhat popular here, although it seriously offends the taste of others, was examined some time ago by the writer and the result of weathering considered dubious.

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*There is room only for an abstract here.

The effects predicted have now become prominently objectionable in several instances*

We have some excellent gray granites within ready access, and many of these are tough, fine grained, fairly homogeneous, with texture and mineral components well adjusted for tooling and polishing satisfactorily. But there are areas in which the lines of jointing and faulting and other structural features have so shattered the masses as to make impossible the procuring of suitable blocks for architectural design. Occasionally these deposits may be utilized for rip-rap, rubble masonry and other structures not demanding regular courses. Still, it is not always safe to employ these without careful examination of the local conditions by an expert. Lines of weakness not apparent from cursory observation may, perhaps, be detected in the lay of the deposit or the geologic conditions of the neighborhood. Sometimes mineral streaks giving no evidence of cleavage will afterwards develop fracture lines in actual use. Again, certain minerals, easily oxidized or disintegrated by wear, may, at first, offer an attractive or apparently serviceable surface, which cannot long withstand the influence of city environment.

These features must be judged on the ground by experts familiar not only with the requirements of construction, but also with the geologic and engineering conditions concerned in each particular problem. It is a prevalent opinion that exposures with the rock badly shattered at surface are liable to show improvement in this respect at greater depth. This idea is commonly erroneous, except as it may apply to deposits wheer atmospheric agencies have been responsible for the surface conditions. And, usually, then the bringing of unexposed portions to air will produce similar results. **Per contra,** it is not always certain that surface exposures of wholly satisfactory material will hold out the same in depth, although the chances are, perhaps, more in favor of such occurrence than otherwise.

There are some black granites in the foothills of the San Gabriel Mountains, which ought to find limited use in ornamental work. For parts, or the whole of monuments, and for some decorative purposes, they are valuable on account of their toughness, variegated appearance and susceptibility of polish. They are usually coarse-grained and do not tool as readily, in consequence. There is some variety in these particulars. Some of our local monument dealers are using fine-grained black granites, which appear to work well, but they are less attractive to most persons.

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*I refer to the staining, really the rusting, of the black minerals along the seams, due to oxidation of the iron-bearing minerals.

Red granites are not so common. These must pass muster on more points of criticism, and probably few of those in this neighborhood are really desirable for general application.

Marbles are extremely variable in quality and in appearance. The desire to utilize local material has carried some of our architects beyond the bounds of prudence. Fortunately the uses made of this rock are mainly decorative, which places them wholly in the class of veneering materials, where they can be replaced if found unsatisfactorily. Much of the Catalina marble which has gone into prominent office buildings of late is regarded as **bizarre** by persons of refined taste, but its bold, bad lines might still be forgiven were it not for the inevitable result. It will certainly "paint the town red" in streaks in the districts where it is used. The black markings contain some **ferrous** mineral, which must oxidize to a rusty brown on exposure to the weather, staining the white lime-rock for some inches on either side. This action, aside from the unpleasant discoloration, will develop lines of weakness; and, if carried far enough, the slabs will fracture and separate along these lines. No serious danger threatens, because the thin veneer of marble sustains little besides its own weight, and it can be removed without weakening the building to which it is attached. The white body of this rock is of fair tint and of good grain.

There are some choice marbles in use in Los Angeles which contain black or greenish black streaks of resistant quality. Some of these have withstod weathering agencies for years without discoloration. The determination whether the particular mineral compositon in any given case will be suitable or otherwise is not very difficult; but the test should be applied beforehand. Otherwise, as has been evident locally, time may demonstrate the disadvantage most expensively.

Red granites and red marbles usually contain iron in ferric oxidation, and if they possess the requisite strength, even if streaked with red, there is not usually any liability to change.

The rocks which form the masses of the high mountains in Southern California are not usually such as will attain popularity for building purposes. An experiment in the new California Club building in Los Angeles, using a rock from near Chatsworth, gives hope of substantial success with this substitute for light buff sandstone. It is a fine grained, mixed rock, rather tender in fracture, rubbing smooth without polish, showing little or no difference between exposed and newly fractured surfaces. There are diffused grains of a black mineral, which might suggest the possibility of reddening later by oxidation. But these specks are scattered so regularly and the rock has apparently been so long exposed, that such result is probably not to be anticipated. If such change should occur, it is very liable to affect the whole surface evenly, which would do us harm unless disintegration were to ensue. This is very improbable.

Within the bounds of the more recent rock series, which form the lowland areas, there are probably some members which may eventually become useful in structural work. But they are generally thin-bedded or too little indurated to be widely serviceable.

We have, however, ample deposits of raw materials suitable for cement and for burning to quick-lime, and these have been capitalized and now constitute important factors in the market supply of structural substances. The manufacture of brick and tile from our local clays has probably not progressed beyond the initial stages of its productive history. Some day there will be a much increased demand for this class of products.

Notes and News

Dr. R. S. Woodward, of Columbia University, was elected President of the Carnegie Institution, by the trustees, December 13th.

An expedition from the Indiana University, under Professors John A. Miller and W. A. Coggshall, will go to Spain to observe the total eclipse of the sun to take place on August 13, 1905.

Luther Burbank has been appointed special lecturer at Stanford. A large grant in furtherance of his masterful researches in plant hybridization has been given him by the Carnegie Institution.

Dr. J. C. Merriam, of the University of California, and Dr. J. C. Branner, of the Leland Stanford Junior University, have both recently returned to the United States from vacation trips to Europe.

The American Institute of Mining Engineers will hold its summer session in 1905, at Victoria, B. C. A special train will leave Chicago June 24th, going direct to Victoria. Following the meeting, an excursion of 21 days by chartered steamer and special trains, will take in Snettisham Bay, Juneau, Skagway, White Horse, Dawson and other Alaskan points, including the Treadwell mines on Douglas Island. Returning to Victoria five days more will be given to British Columbia mining districts. Eastern participants will reach Chicago, upon the return, early in August.

PUBLICATIONS REVIEWED.

The Cementing Power of Road Materials. By Logan Waller Page and Allerton S. Cushman, of Division of Tests, U. S. Dept. Agric., Bur. of Chem. Bull. No. 85. Washington, 1904. Pp. 24, 1 Pl.—A timely and most valuable contribution to an important subject by worthy experimenters. The methods of testing are clearly described and illustrated by cuts in the text. It is demonstrated by their work that the binding quality of road metal is not due to particular chemical elements, but to the degree of hydration. Therefore, it is not practicable to determine the relative values of different rocks, in this respect, by lithologic examination or by mere chemical analysis. A table of tests already made from various widely scattered localities in the United States affords interesting suggestions, but it is too early to draw wholly reliable conclusions as to the geographic distribution of the most suitable road-making materials. Engineers have heretofore given far too little study to this important subject.

The "Instituto Geologico" of Mexico continues to send out notes and papers of scientific interest. Vol. I, No. 4 contains a somewhat exhaustive study of a theory upon which Dr. Almarez had predicated the probability of the existence of petroleum in Aragon. Sr. Villarello critically dissects the author's reasoning and concludes that it is inconclusive and inapplicable, and that no evidence of the occurrence of oil there in commercial quantity has been produced. An excellent plate of a large meteorite is given by Dr. Angermann, who describes it, with an interesting account of its discovery, in 1863, and its announcement scientifically, in 1876 and 1889. Dr. Henry A. Ward, of Rochester, N. Y., had it exhumed and he more fully described it in 1902. In Vol. I, No. 5 (titled elsewhere in full), valuable notes on the earthquake of 16th Jan'y, 1902, in Guerrero, are given from studies on the ground by Drs. Bose and Angermann, both diligent workers, whose labors have been earlier announced in the "Parergones." The article on an asbestiform mineral, in the same issue, by Senor Villarello, an engineer of repute, is very thorough. He concludes that this is an aluminum hydrosilicate, allied to the kaolins, approximating montmorillinite, with some physical features of asbestos, from which it materially differs in composition and properties. It does not bear out the hope raised for its application in the arts as a perfect substitute for asbestos, although it has limited usefulness in that direction.

In Dr. Merriam's description of "A New Marine Reptile From the Triassic" of Shasta County, there are some points of great technical interest and bearing upon the development of vertebrate types. But, more than this, we have in the discovery and publication a fitting tribute of Miss A. M. Alexander, "who has not only contributed generously to the financial support of the work on the vertebrates of the Marine Triassic, but was herself the discoverer of the type specimen," which has been named in her honor, **Thalattosaurus alexandrae.**

Cost of Pumping for Irrigation, in ten examples selected by Professor Woodward, of the University of Arizona, varied from less than 4 cents to more than 29 cents per acre-foot of water raised one foot. The best results are due to the application of brain power to the problem of adapting the machinery to the duty at hand. In other words, the investigation once more emphasizes the costliness of saving engineers' fees at the start. One plant, with wood at lowest cost per unit, had the greatest cost per unit of power developed, and the greatest cost for attendance, lubricating, repairs, etc., although the duty required was actually the lowest. An interesting fact brought out is that two pumps at the University of Arizona, operated under practically the same conditions of duty, were very close in performance and costs, one being of reciprocating type, run by steam from wood fuel, the other a centrifugal pump, run by electricity. The cost of the electricity is given at 5 cents per kilowatt-hour, this apparently being the price paid for current to the local electric company. This is not the place to discuss the engineering features, nor does Professor Woodward regard the small number of tests as more than illustrative of a few general principles. But the work is important, and it is to be regretted that the removal of Mr. Woodward to take the professorship of Steam Engineering in the University of Iowa is about to deprive Arizona of his valuable services.

Dr. Calm, well known in Los Angeles, has done good service by his thorough investigations concerning the effects of ''Sulphurous Acid and Sulphites as Food Preservatives.'' His paper cited gives details of his researches, from which his own conclusions follow logically. He decides that these preservatives are harmless, not only because not deleterious in themselves, but because they cannot preserve any but untainted substances; and, if used in excess, the results are such as to give due warning to consumers.

The recent Bulletins of the Agricultural Experiment Station of the University of California evince careful work. The lines of investigation are mainly in directions which need long continued study and comparison. The future importance of the olive oil and wine industries depend upon the solution of just such problems as are now under examination. The laws and methods of fermentation and the effects of temperature and composition are too little understood. New information upon these subjects is continually being brought out by the station workers. Although the immediate practical results are often made the measure of their worth, and here they rarely fail to pay their way, the ultimate gain to pure science is far beyond what many realize.

The Mining Magazine for December is rich in concise, complete, well digested reviews of current progress in mining and metallurgy. The iMning Digest and Mining Index are thorough and well arranged for convenient reference. Among the many periodicals regularly reviewed we find our own **Bulletin of the Southern California Academy of Sciences.**

The deepest well-boring in the United States for oil or gas, according to the Engineering and Mining Journal, is on the Bedell farm, West Elizabeth, Pa., twelve miles southwest of Butler. It has a depth of 5,575 feet, and was completed in 1898. The diameters of casing, from top downward, are: First 40 ft., 10 in.; next 320 ft., 8.25 in.; next 1,000 ft., 6.25 in., the remaining distance (below 1,360 ft.) being an uncased boring of 6.25 in. diameter. The temperatures, as taken by Professor Hallock, of Columbia University, were: At 525 ft., 57 deg. F.; at 2,252 ft., 64 deg. F.; at 2,397 ft., 78 deg. F.; at 5,010 ft., 120 deg. F.; at 5,380 ft., 127 deg. F.

The boring was stopped by accidental loss of string of tools, closing up the last 1,000 feet of the hole.

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